

PROVINCE OF SASKATCHEWAN

REPORT
OF THE
Royal Commission
OF
Inquiry Into Farming Conditions

PRINTED BY ORDER OF THE LEGISLATIVE ASSEMBLY



REGINA:
J. W. REID, King's Printer
1921

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REGINA, *January 31, 1921.*

THE HONOURABLE W. M. MARTIN,
Premier of Saskatchewan.

SIR,—

I have the honour to present herewith the Report of the Commission appointed by Order in Council of August 23, 1920, to inquire into the condition of the farming industry in the western and south-western portions of the province and in the provinces and states adjacent to this province, if deemed necessary, and to report to your Honour and to recommend to your Honour such legislation as they may deem desirable.

I have the honour to be, Sir,

Your obedient servant,

W. J. RUTHERFORD,
Chairman of Commission.

PROVINCE OF SASKATCHEWAN

ROYAL COMMISSION OF INQUIRY INTO FARMING
CONDITIONS

ORDER IN COUNCIL

Following is a copy of the Order in Council appointing the Better Farming Commission.

APPROVED and ORDERED

O. C. 1626-20.

R. S. LAKE,
Lieutenant-Governor.

REGINA, Monday, August 23, 1920

The Executive Council has had under consideration a report from the Minister of Agriculture, dated August 20, 1920, stating that for some time past the condition of the farming industry in the western and southwestern portions of the province has not been very satisfactory, and it is deemed advisable that an inquiry should be conducted into certain matters affecting the welfare of this industry, under the provisions of an Act respecting Inquiries concerning Public Matters, being Chapter 18 of the Revised Statutes of Saskatchewan, 1909.

Upon consideration of the foregoing Report and on the recommendation of the Minister of Agriculture, the Executive Council advises that a Commission do issue to William J. Rutherford, Esquire, Dean of the College of Agriculture, Saskatoon; John Bracken, Esquire, President of the College of Agriculture, Winnipeg; George Spence, Esquire, Member of the Legislative Assembly, farmer, Monchy; Neil McTaggart, Esquire, farmer, Gull Lake; and H. O. Powell, Esquire, General Manager of the Weyburn Security Bank, Weyburn, directing and empowering them to inquire into the condition of the farming industry in the western and southwestern portions of the Province and in the Provinces and States adjacent to this Province, if deemed necessary, and to report to your Honour and to recommend to your Honour such legislation as they may deem desirable.

The Executive Council further advises that the said Commissioners shall have all powers, authority and functions authorized by the said Act respecting Inquiries concerning Public Matters to be conferred upon the Commissioners appointed thereunder; that said Commission shall have the power to hold meetings at various points throughout Saskatchewan and at points outside the Province for the purpose of hearing evidence; that the said Commissioners shall have the power, within Saskatchewan, and, in so far as such power may be conferred upon them by lawful authority, outside of Saskatchewan, to summon witnesses before them and of requiring such witnesses to give evidence on oath orally, or in writing, or on solemn affirmation (if they are persons entitled to affirm in civil matters) and to produce such documents and things as the Commissioners may deem requisite to the full investigation of the matters into which they are appointed to inquire, and that the said Commissioners shall have the power, subject as aforesaid, to issue subpoenas for enforcing the attendance of such witnesses, and to cause the evidence given before them, or any portion thereof, to be taken in

shorthand, and to administer or cause to be administered the necessary oaths to witnesses, constables, stenographers and others, to whom an oath may be administered to the same extent as may now be done in a court of law.

The Executive Council further advises that your Honour shall confer upon the Commissioners all the powers, rights and privileges concerning the investigation of the matters referred to them in the making of the said Inquiry, the execution of the Commission, the examination of witnesses, the taking of evidence, and the production of documents and things which are possessed by or conferred upon a Judge in the trial of cases either by common law or by statutes, it being intended that the said Commissioners shall have the said rights, powers and privileges as Judges of His Majesty's Court of King's Bench for Saskatchewan have in the trial of civil cases and in all matters incidental thereto.

The Executive Council further advises that William J. Rutherford, Esquire, be Chairman of the Commission.

The Executive Council further advises that the Commissioners be empowered to appoint such clerical and other assistance as they may deem advisable for the purposes of their inquiry.

The Executive Council also advises that the Commissioners be empowered to direct that the evidence taken in shorthand shall be extended and certified to by the stenographer or stenographers, and that the same, after being so extended and certified, together with so much of the evidence as may be taken in any other manner, certified by the Chairman or by the Secretary of the Commission as being substantially correct, shall be returned with the Commissioners' report to your Honour-in-Council, and that the Commissioners be empowered to appoint the places where and the time when sittings of the said Commissioners shall be held and to adjourn such sittings if necessary from day to day and from time to time to enable the matters referred to the Commissioners or arising in connection with the investigations to be fully and completely enquired into and investigated.

Certified a true copy,

J. W. McLEOD,
Clerk Executive Council.

ACKNOWLEDGMENTS

The thanks of the Commission are due to Prof. A. M. Shaw, Prof. Roy Hansen, and Prof. Manley Champlin of the College of Agriculture, Saskatoon; Mr. S. H. Vigor of the Department of Agriculture, Regina; and Mr. Jack Byers, President of the Saskatchewan Stock Growers' Association, for assistance in connection with the inquiry. The Commission wishes also to acknowledge assistance received from the Department of the Interior in allowing Mr. J. W. Greenway, Commissioner of Dominion Lands, to spend some weeks in Saskatchewan, and personally accompany sub-committees in a study of certain phases of the work of the Commission.

To all those who attended meetings of the Commission and reviewed their experiences in agriculture and presented their views regarding the industry in their respective districts, the Commission is deeply grateful.

The greatest courtesy and assistance was furnished by eminent agriculturists in Montana, North Dakota, Minnesota, Wisconsin and Illinois, where a sub-committee of the Commission sought information respecting certain phases of the problem they were asked to investigate. In this connection the Commission is specially indebted to Prof. F. B. Linfield, Dean of the Montana State Agricultural College, and Director of the Montana Experiment Station; Dr. P. F. Trowbridge, Director of the North Dakota Experiment Station, and Dr. F. J. Alway, Chief of the Division of Soils, University of Minnesota, for their assistance, and to Dr. A. G. Johnson, Associate Professor of Plant Pathology, University of Wisconsin; Professor K. L. Hatch, Professor of Agricultural Education, University of Wisconsin, and Dr. Davenport, Dean of the College of Agriculture of the University of Illinois, for information and courtesy in connection with the inquiry.

Last, but by no means least, the members of this Commission wish to express their thanks to the Deputy Minister of Agriculture, F. H. Auld, who has acted in the official capacity as Secretary of the Commission, and has labored untiringly in assembling the information necessary for the purpose of this report.

EARLY DEVELOPMENT OF SOUTHWESTERN SASKATCHEWAN

At the time of the early development of grain growing in the Qu'Appelle Valley region in Eastern Saskatchewan, in the "eighties," the raising of live stock was assuming considerable proportions in southwestern Saskatchewan. The latter region had the reputation of being one of the best all-year grazing areas in North America for certain classes of live stock, this reputation being due mainly to two conditions, namely: the fact of the prairie grasses being forced to maturity by drought before the frost affects them, thus preserving a supply of nutritious grasses cured where they grow; and the fact of the snowfall, light and scanty at most, being usually removed by the dry chinook winds which evaporate the moisture and leave the grasses exposed for grazing.

The ranching era had its handicaps, however. Occasionally the chinook failed to appear when desired, and cattle and sheep were subject to serious losses when winter feed had not been provided. A number of such disastrous seasons are within the memory of present day stock raisers, and their occurrence indicated that the system followed contained a considerable element of risk.

The development of grain growing in Southwestern Saskatchewan was not expected nor encouraged fifteen years ago. That area was generally believed to be useful for stock raising. The attraction of free land, however, was so strong that when other areas had once been gone over and the best of them homesteaded, no excuses were accepted by those who wanted to file in the Southwest. In recognition of the fact that its productivity was believed to be less than the eastern part of Saskatchewan a "preemption area" was established by law and settlers were permitted to homestead and to buy in addition a preemption or a "purchased homestead" of 160 acres at a price of \$3.00 per acre. About 50,000 quarter sections in Southwestern and Western Saskatchewan were sold in this way.

The building of highways and railways soon followed the closer settlement of the Southwest. Through the joint effort of the Provincial Government and Rural Municipalities much has been done to develop a system of highways. Railway companies have constructed several branch lines, and while there are many settlers who are still long distances from railway services, much has been done to provide service for them, and the completion of construction work which is now under way will greatly improve conditions of transportation in the more remote communities. The time and expense incidental to the marketing of crops produced under such conditions was, however, of very considerable importance and militated against those who were most seriously affected.

Settlers located in the southwest in large numbers between 1901 and 1915 as the figures contained in the chapter on "Agricultural and Live Stock Development of Southwestern Saskatchewan" will show, and an area in the southwestern quarter of the province somewhat less than that which in 1901 had a population of 17,692 had a total population of 178,200 in 1916.

Those who homesteaded in Southwestern Saskatchewan experienced success and failure, and both in a measure rarely, if ever, equalled by their fellow pioneers in the eastern half of Saskatchewan. The crops of 1915 and 1916 made an unprecedented record of bountiful production.

The years 1914, 1917, 1918, and 1919, proved trying in the extreme, and those whose possessions were small when they located found themselves handicapped by debt and in need of credit assistance following these years of crop reverses, when governments and municipalities found it necessary to spend considerable money in providing seed, fodder and relief on credit terms to those who had been unfortunate.

REASONS FOR THE INVESTIGATION

Throughout the dry years, however, there were some who were able to grow some crop every year, and this fact encouraged people to hope that investigators might find crops better suited to Southwestern Saskatchewan than those commonly grown and a system of farm management which would make the farms less liable to crop failure and the farmers more able to withstand the effects of drought seasons. The desirability of finding such crops and of devising such a system has for some time been prominent in the thoughts of many residents, and toward the end of 1919 numerous requests were made to the government for a special study of the situation in the hopes that some means might be found to make crop production more sure and agriculture more profitable.

The government was asked to hold at some central point a conference of professional agriculturists and practical farmers from Southwestern Saskatchewan who had attained success, so that they might take stock of the situation and endeavour to determine what methods of farming are likely to produce the greatest measure of success in that region. The "Better Farming Conference" at Swift Current in July, 1920, was a result of these requests, and a very enthusiastic meeting was held at Swift Current, July 6, 7, and 8, when a number of the leaders in experimental agriculture met with a number of practical farmers, and an instructive programme of addresses and discussions took place.

The object of the Conference was outlined by Hon. C. M. Hamilton, Minister of Agriculture, in the following words:

"The need for some closer study of agricultural methods in the Province of Saskatchewan and with particular reference to the western and southwestern portions, has been manifest during the past three years. It is an impression of long standing that the western and southwestern portion of Saskatchewan was not so favorably situated for the growing of crops as some other sections of the province. The years 1915 and 1916 had the tendency to dissipate that impression, but with the recurrence of drier seasons in 1917, 1918, and 1919, it has become evident that the system of farming which has proven successful or somewhat successful in the eastern and northern portions of the province cannot be relied upon. The conditions during these years have been such that the people upon the farms have not been able to produce a crop sufficient for the necessities of life, for feed for their stock and for seed for the succeeding year.

During these years the government of the province has been compelled to go to their relief to a very considerable degree. These conditions are far from satisfactory, either to the people concerned or to the province as a whole. To have any considerable number of our people who are required to accept assistance from the government, does not tend to the building up of a strong, self-reliant population. We therefore believe it to be the duty of the government to give these conditions the best study possible with a view to promoting a system of farming which can be carried on profitably in these semi-arid sections of the

province. I believe the policy which has been announced upon some occasions that the farming operations should be such that they would assure a living return from the farm every year, and the hope of building up a reserve on favorable seasons is a sound policy, and along these lines we should attempt to build.

In making a study of conditions of agriculture in the Province of Saskatchewan, with particular reference to the western and southwestern sections of the province, it would possibly be of interest to review briefly the history of agriculture in the Province of Saskatchewan. The first settlers came in just previous to the construction of the C.P.R. and agricultural development commenced about the year 1882. From 1882 to about 1888 might be termed as more or less of an experimental stage. During these early years it was found very difficult to grow crops successfully and many of the first settlers in what are now considered to be the most highly developed portions of the province were compelled to leave. The obstacle in those days, as in these days, which appeared to confront the agriculturist was the lack of moisture, and the early attention of those interested in the growing of crops was given to the question of conserving the rainfall. The Experimental Farm which was established at Indian Head, did much to establish the fact that a system of summerfallowing every third year would to a large degree assist in conserving the moisture and assure a profitable crop. This system of farming has been carried throughout the whole province by the circulation of the results of the experiments at Indian Head. The farmers adjacent to the experimental farm also were equally progressive with the government, and the fact that the results of the average farmer were as good as those of the government farm went a long way towards dispelling the idea that these conditions on a government farm were special conditions and could not be equalled by the average individual.

The next period to which I might refer is a period from 1889 to 1919. This period may be described as a period of development. From a small section along the main line of the C.P.R. in Eastern Saskatchewan, settlement has spread throughout the whole province. The system of farming devised and followed by those first settlers was carried to the larger area with more or less success. Let me say just here that wherever one or more of the settlers from this older portion of the province went and settled in a newer section he became a missionary for the summerfallowing system of farming. The success of this system of farming is not to be minimised; Saskatchewan has reached a high place in the Dominion of Canada and throughout the world as a grain producing province both in quality and quantity; our grain has stood high, and much credit is due to those pioneers who blazed the trail for this development and progress. The system which has been so successful in certain sections of the province has not brought equal success in the western and southwestern areas. We therefore are endeavoring to give these conditions special consideration.

With the year 1920 I believe we should commence upon a new period of the agricultural history of our province. These periods cannot be defined to a year; but refer to the general development of the industry. It is because the system that has been followed for the past 38 years has begun to show certain defects. We are not looking for a new system; it is not a new system; it has long been foreseen by our leaders in agriculture. I read it in the report of the experimental farm at Indian Head for the year 1899, but now it is being forced on us by necessity.

The system of summerfallowing, while it has been successful in retaining the moisture, has had the result of taking from the soil some other very necessary ingredients for the production of crops. The very

fine tillage, which was advocated in our summerfallowing system, has reduced the amount of humus or vegetable matter in the soil to such a degree that now the drifting of soil has become a very severe hindrance. It has also had the effect of reducing the amount of nitrogen which is so necessary in the production of crops.

With this condition confronting us it has been thought wise to give special consideration and study to the question of agriculture under these new conditions. The conference has been called to study particularly the conditions in the western and southwestern sections of the province; but we hope that something may come out of it that will be of benefit to the whole province. There are those who say that the western and southwestern portions of the province should never have been settled, that a great mistake was made when farmers were allowed to go in and take up homesteads, that this large area should have been left to the ranchers. I am not prepared to take that ground at the present time. The fact is the people are here and I believe it to be our duty to put forth every effort to endeavor to put agriculture on a sound basis throughout the whole area of the Province of Saskatchewan. It does not appear that with a soil such as we have over a considerable portion of this area it is impossible to produce grain and stock profitably. I do not believe that this is an arid area or if the best methods are followed that farming cannot be carried on with profit to the people and certainly in the interests of the province and the dominion.

It may be that in certain sections which are largely composed of sand it might be necessary to have a portion of the settlers removed from these districts and re-seed the land to grass; but this can only be done after a careful investigation and survey of such conditions. In the study of the question of agriculture in the year 1920, with particular reference to the western and southwestern portion of the province, we have called to our assistance and asked for advice at this conference agricultural experts from our own province, of whom we have a number of eminent men. We have also asked for the advice of agricultural experts from the adjoining provinces. In addition to these we have in the province of Saskatchewan within the area affected a number of men who have made more or less a success of carrying on their farming operations even during these past three years. The practical men we have also asked to come and give us the value of their experience. We have not confined our activities for the securing of information to our own experts and men on the ground, but we have invited from the United States, from the Dakotas, Montana and Minnesota, agriculturists who are giving special study to farming conditions there which are somewhat similar to ours.

We have asked these men to come in order that we may have first hand assurance that it is not impossible to bring better farming conditions throughout our province. I am pleased to see that we have such a large representation from all those various branches, and I hope that the result of the conference may be beneficial to the people who are putting forth such a strenuous effort to carry on their farming operations, believing further that if our agricultural people are successful, their success will be reflected not only on our farms but also in the towns and cities throughout our province and our dominion."

Before the adjournment of the Conference the following resolution was unanimously adopted:—

BE IT RESOLVED that this Better Farming Conference hereby express its appreciation of the action of the Minister of Agriculture for Saskatchewan in endeavouring to direct the

agriculture of Southwestern Saskatchewan along safer, more permanent and more profitable lines, AND

BE IT FURTHER RESOLVED that we hereby request the Honourable Minister to appoint a Committee to make such detailed study of the situation as may be necessary to enable them to recommend to the Government and the public such action as they deem essential to bring about the desired agricultural improvements, AND

BE IT FURTHER RESOLVED that we request the government to publish and distribute a report of this Better Farming Conference and the recommendations of the Committee and that we request that the Conference be made an annual event.

The appointment of the Better Farming Commission followed this request.

HISTORY OF THE INVESTIGATION

The Commission met in the Parliament Building, Regina, for organization purposes on August 24th, 1920, when, after considering the instruction to the Commission, it was agreed that in so far at least as Southwestern Saskatchewan is concerned (although the scope of the Commission was not limited to that area), a study should be made of (1) The grazing land situation including the need, advantages and possibilities of community grazing areas. (2) The control and prevention of soil drifting and the reclamation of drifting soils. (3) The desirability and possibility of moving settlers from inferior lands to better lands. (4) A system of farm management suited to Southwest Saskatchewan. (5) The need for further investigation and experimental work, and the methods of experimentation best suited to our conditions, and (6) The means and methods of extending agricultural knowledge throughout the country.

It was decided that the amount of work to be done necessitated the assistance of persons outside the Commission, and three sub-committees were appointed as follows:

Committee on Drifting Soils—

Prof. R. Hansen, S. H. Vigor and Prof. M. Champlin.

Committee on Grazing Lands—

Geo. Spence and Prof. A. M. Shaw, Mr. J. W. Greenway, Commissioner of Dominion Lands, and Mr. Jack Byers, President of the Saskatchewan Stock Growers' Association, accompanied this sub-committee.

Committee on Investigation and Extension—

Prof. Bracken, H. O. Powell and Hon. Mr. Hamilton.

The committee on drifting soils made a detailed study of drifted areas in the vicinity of Mortlach and Tessier, consisting of 133 square miles in the former and of 27 square miles in the latter place.

The committee on grazing lands visited typical districts in several localities in the Southwest and interviewed a considerable number of farmers and ranchers. They also prepared and issued the following questionnaire by which they were enabled to obtain valuable information from many residents of the districts north, south and west of Swift Current.

BETTER FARMING COMMISSION

Questionnaire re Survey of Grazing Land Sub-committee, 1920.

1. Land occupied by _____ of _____
 Qr. Sec. Tp. Rgr. W. Mer.
 Owner
 Tenant.
2. Distance to Market.
3. Nature of winter feed for live stock.
4. Source of hay supply.
5. Acres of pasture required per head.
6. Available range. How utilized.
7. Is the keeping of live stock essential to your success?
8. Source of water supply: well, surface, stream or spring available.
9. Kinds of cattle.
 a. Milch cows—
 b. Beef cattle—
10. How handled—
 a. Milk or cream sold—
 b. Butter sold—
11. Has the rainfall been sufficient to ensure a paying crop of grain on summerfallow during the past five years?
12. What would you say about a grass crop in your rotation
 a. For hay?
 b. For pasture?
13. General remarks.

The committee on investigation and extension, visited the State Agricultural Colleges and Experiment Stations in Minnesota, North Dakota, Wisconsin and Illinois for the purpose of studying at first hand their methods of experimentation and the organization and success of the system of County Agricultural Agents.

These special studies having been completed, the Commission arranged for public hearings to be held as follows:

| | | | |
|-------------|-----------|------------|---------|
| Mortlach | Monday | October 11 | 2 p.m. |
| Herbert | Tuesday | October 12 | 2 p.m. |
| Leader | Wednesday | October 13 | 2 p.m. |
| Cabri | Thursday | October 14 | 2 p.m. |
| Gull Lake | Friday | October 15 | 10 a.m. |
| Tompkins | Friday | October 15 | 2 p.m. |
| Maple Creek | Saturday | October 16 | 2 p.m. |
| Senate | Monday | October 18 | 2 p.m. |
| Eastend | Tuesday | October 19 | 2 p.m. |
| Robsart | Wednesday | October 20 | 2 p.m. |
| Shaunavon | Thursday | October 21 | 4 p.m. |
| Ponteix | Friday | October 22 | 2 p.m. |

All these were duly held, and each was attended by from 30 to 50 farmers, many of whom related their experiences to the Commission and freely offered their experiences and opinions respecting agriculture and stock raising.

The information gained by the special committees and the Commission as a whole has been used in summarizing the conditions which it found in Southwestern Saskatchewan, and from which its conclusions and recommendations are drawn.

Throughout the inquiry your commissioners endeavored to ascertain the facts of the situation with a view to determining what developments would be in the best interests of the country as a whole. Undoubtedly Southwestern Saskatchewan is capable of sustaining a large number of people and a large number of live stock. Whether those people are to follow grain growing or stock raising or a combination of these and whether the stock is to be owned by ranchers or farmers, is of less concern to your commissioners than that such use shall be made of that area as will bring about the maximum of agricultural production, the greatest conservation of its soil resources and the utmost prosperity for the largest possible population.

PHYSICAL FEATURES OF THE AREA STUDIED

The area to which the Commission devoted special study lies to the west of the Soo Line from Portal to Elbow and to the south of the Saskatchewan river. Much of this region is undulating prairie. There are, however, ranges of hills on the east, the south, and in the southwest. It is bordered on the east by the Missouri Coteau, a range of low rolling hills known locally as the Dirt Hills, which constitutes the Eastern boundary of the third prairie steppe, averaging in elevation about 2,400 feet above sea level. This range of hills is believed to have been the western shore of the great "Lake Saskatchewan," supposed to have at one time covered a large portion of Eastern and Northern Saskatchewan. The Coteau is about 30 miles wide and extends from North Dakota in a northwesterly direction for a couple of hundred miles or more. The Cypress Hills, the eastern end of which is in Saskatchewan, has a maximum elevation of 4243 feet above sea level and is the highest point in Saskatchewan. Another high point is Wood Mountain, with an elevation of 3,471 feet.

Through Southwestern Saskatchewan runs a fairly well defined watershed in which are narrowly separated creeks, some flowing to the north and others to the south. Those to the north feed the Saskatchewan river and low lying lakes, and those to the south flow into the upper reaches of the Missouri. The flow, however, is mainly in the spring, and later in the year many of them are dry ravines.

Lakes are comparatively few in number, shallow and of an alkaline nature. There are two large lakes—Lake Johnson and Lake Chaplin and several small ones—Twelve Mile Lake, Willow Bunch Lake, Crane Lake, Bigstick Lake and Cypress Lake, and numerous smaller bodies of water of some local importance.

SOIL AND NATIVE VEGETATION

Several types of soil are found in the southwestern quarter of Saskatchewan varying from a good quality of chocolate clay loam to sandy loam and sand, with clay and alkaline soils and so-called "burnouts" in some localities. The percentage of good soil can only be definitely

stated after systematic soil surveys have been carried on throughout the area. It is considered, however, that about eighty-five per cent or less of the soil is well suited for the production of wheat and other cereals.

The better soils, which largely predominate in this region, are well provided with the essential elements of fertility, but the soil in general is not abundantly provided with humus, a very important constituent which largely determines the water holding capacity of a soil. A destruction or reduction of the humus in the soils of this region with its tendency to cause soil drifting is more to be feared than the exhaustion of the other elements, which are present in such volume as to occasion little or no alarm on this account.

The Sand Hills northwest of Maple Creek, and the sandy loam bordering this area and traceable for a considerable distance, particularly eastward, are clearly of inferior quality for crop production under climatic conditions prevailing in this country of limited precipitation and high wind-velocity. The same is true of smaller areas which are found elsewhere in Southwestern Saskatchewan.

Several areas in this region have imperfect drainage and the water which flows to them from higher levels carrying with it alkaline salts in solution does not find an outlet and must therefore evaporate or remain in shallow lakes. Such areas have thus accumulated considerable quantities of alkaline salts, and portions thereof are for this reason unsuited for crop production.

The "burnouts" found to a limited extent in this part of Saskatchewan also constitute a problem. These "burnouts" are found in somewhat local areas varying in extent from a few acres or a few sections to a few townships. The surface soil in spots varying from a few square yards to an acre or more, appears to have been removed by some agency, leaving a close heavy clay which is difficult to till and rarely produces paying crops, due mainly to the difficulty of securing an even germination and maturity on such land. The space between the burnout spots appears to be normal soil.

Native vegetation in Southwestern Saskatchewan consists mainly of short prairie grass composed of many species and known locally as "prairie wool," which is eminently suited for pasture purposes and is of particular value for winter grazing because of its being "cured" where it grows and without deterioration from frost. Cactus, sage bush and other forms of vegetation native to arid regions are not found in large quantities and are not general. Towards the western boundary of the province is their most frequent occurrence.

The prairie in this part of Saskatchewan has little tree growth except in portions of the Cypress Hills and Wood Mountain and along water courses and ravines. Trees of considerable size are found in the Cypress Hills and a small amount of lumbering has been carried on there under permit from the Forestry Branch of the Department of the Interior.

WATER SUPPLY

Southwestern Saskatchewan has, as compared with other parts of the province, a fairly abundant water supply, and wells are not hard to obtain, except in the areas of deep and somewhat impervious clays. Under these circumstances a reservoir or dugout to hold the spring runoff is frequently used as a substitute for a well.

The value of an adequate water supply is hard to overestimate in an agricultural district. A water supply makes stock raising and dairying possible, and where these are possible, farming may be so diversified

as to make one very largely independent except in years of complete failure, and these can be gotten through by carrying over reserves of fodder from the years of plenty to the years of drought. (A bulletin on reservoirs has been published and may be obtained from The Irrigation Branch, Department of the Interior, Calgary, Alberta. To those requiring them, the Department of Highways, Regina, also provides standard specifications and a plan for the construction of reservoirs.)

CLIMATE

The climate of Southwestern Saskatchewan in comparison with other parts of the province has probably a little less precipitation and a little greater evaporation. Southwestern Saskatchewan is within the range of the chinook winds which make a warmer and more variable winter climate than the rest of the province, and this factor also renders that area more subject to dry hot winds in summer.

Speaking at the Better Farming Conference at Swift Current on July 7th, Sir Frederic Stupart, Director of the Meteorological Service for Canada, explained briefly some of the reasons why regions lying to the east of the Rocky Mountains have a limited rainfall. He also stated that the climate of a country undergoes no appreciable change in a hundred or a thousand years, although variations from year to year do occur, and gave reasons for believing that the efforts of man to produce rain have no positive effect. A summary of Sir Frederic's very interesting address follows:

"It was necessary that a proper appreciation of certain elementary facts be obtained in a study of this question," Sir Frederic said. "The earth's atmosphere envelops almost, but not quite uniformly, the whole of the surface of the globe exerting a pressure of 14.7 lbs. per square inch. It is mainly composed of a mixture of nitrogen and oxygen in definite proportions and also of a certain amount of water vapour which varies with temperature and locality. The higher the temperature the more moisture is the air capable of holding, and if the air is saturated any fall in temperature will cause rain."

Sir Frederic said that the air of the globe is practically never at rest. There is a general circulation which is a phenomenon of marvellous beauty and wonderful intricacy, a circulation which in reality makes the earth habitable to man. In the western provinces we live in the middle latitudes where the flow of air is from west to east, but in certain regions of these latitudes in the west there is a comparatively light precipitation. Further eastward in the region of the Great Lakes there is either ample precipitation or more than ample.

The climate of southwest Saskatchewan was connected with the distribution of temperature over the globe and with the general wind circulation. Changes occurring in far off regions must have an effect on the weather in the western provinces.

Enquiring why the difference, the speaker stated that the cooling of air which leads to rain is caused by expansion which occurs when the air rises upwards from the earth's surface. This uplift occurs most frequently when conditions are what the Meteorologist terms cyclonic, or perhaps we had better say when the barometer is low. Sometimes, however, rain falls with a high barometer as when dense cold air lies over the country and a warm current from the far southwest begins to flow over the cold air. Other conditions which lead to rain are when warm air is lifted by a flow of cold air coming in from the northward.

Sir Frederic stated that in summer the westerly winds from the Pacific were cool and moist, and in passing to the land were warmed up,

and at that season there is little rain in British Columbia. Passing onwards over the mountains and through the passes, the relatively moist air reaches the prairies, where convectional currents lead to the summer rains.

Speaking of the effect of chinook winds, Sir Frederic said the chinook wind was a strong wind coming from the Pacific, containing a vast amount of moisture which was deposited on the western slopes of the mountains. Condensation of this moisture through dynamical effect retards the cooling of this air, and on arriving at the mountain crests it is at a much warmer temperature than it would have been had the moisture not been condensed.

Having passed over the mountains the air comes down to lower levels on the prairies and as the temperature rises, it becomes more and more capable of holding moisture and hence by the time it arrives at the Alberta levels it has much the same temperature as when it left the Pacific coast, and then it is that we get the chinook winds on the prairies. The chinook wind has a far-reaching effect. Snow may come but the chinook takes all the moisture away. That has a great deal to do with dry lands in this part of the country.

Unfortunately for Saskatchewan and Alberta they lie, as it were, under the shadow of the highest portion of the great mountain ranges and in seasons when the westerly drift brings the air directly over these high mountains it becomes almost dried out and there is scarcity of rainfall because no matter how the air is cooled there can be no rain if there is no moisture.

As to the possibility of changes of climate, Sir Frederic said it had been found that the climate in Southern Europe and Southern Asia had not changed in the last 2,000 years. The climate of Syria and Egypt and the Mediterranean was today almost identical with that of 2,000 years ago. There was no reason to suppose that the climate on the North American continent would permanently change. Professors Gregory, Huntingdon and many others were of this belief, and he believed that we may not look for any permanent change either one way or the other. In the west there had been periods of drought and wet weather and he believed similar conditions would obtain in the future. Some had thought that cultivation of soil might have an effect. This was a question to which particular attention had been given, but so far they had not been able to say, even in the east, that the climate had changed, or would change.

There was perhaps some slight indication that the temperature of the summers was just a trifle warmer and the winters a trifle colder. Increase in heat may be traced to deforestation, but Sir Frederic's opinion was that the effect was very small. In Ontario it has been noted that in the early days of settlement there seemed to be a greater liability to summer frost than today. "I have studied the temperatures of the West since about 1886," said Sir Frederic, "to the present and cannot see that there has been really any appreciable change in the date of the last frost of spring and the first of fall."

Sir Frederic said he could not imagine any portion of the world where there was less chance of a change than in the western provinces. The great Pacific Ocean was to the west of the mountains and the great prairies immediately to the east. One could scarcely believe that any small thing that man could do in cultivation would have any effect in altering the climate. The agriculturist would have to find means by which he could make the best of conditions as they exist. He was not a believer that man could do anything to encourage rain.

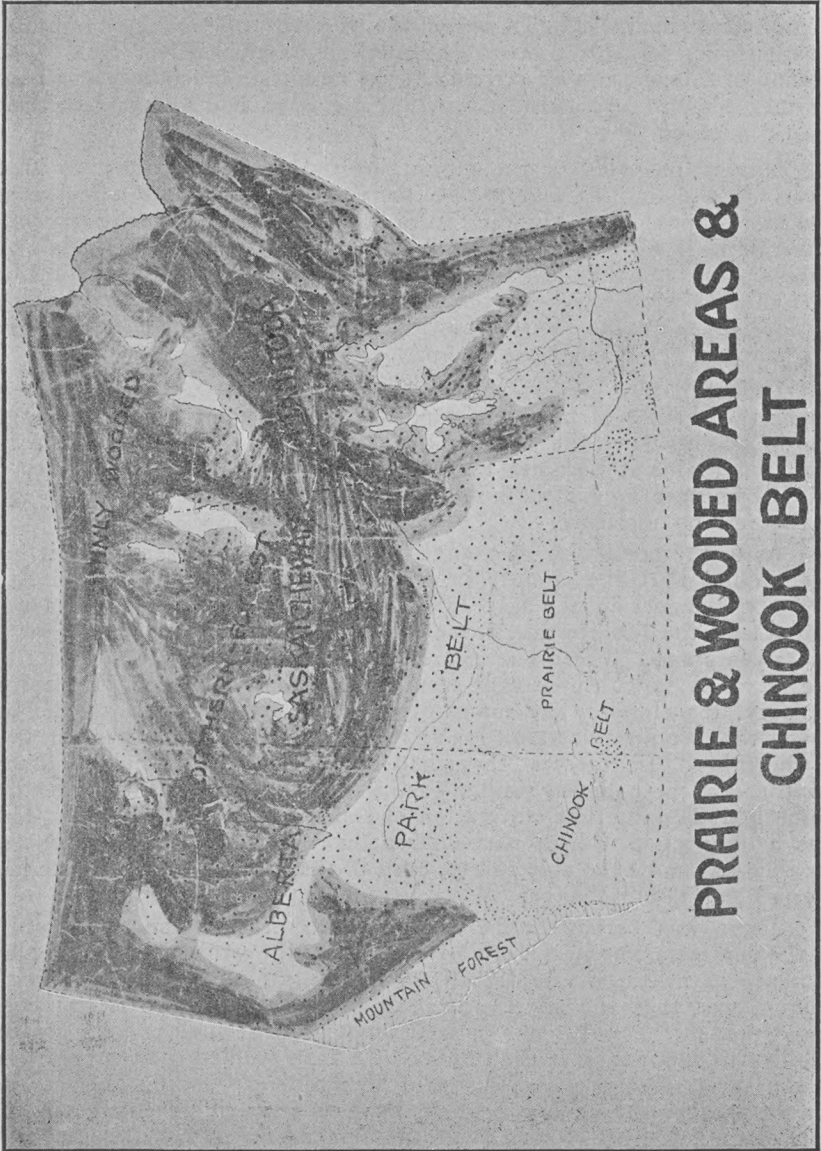
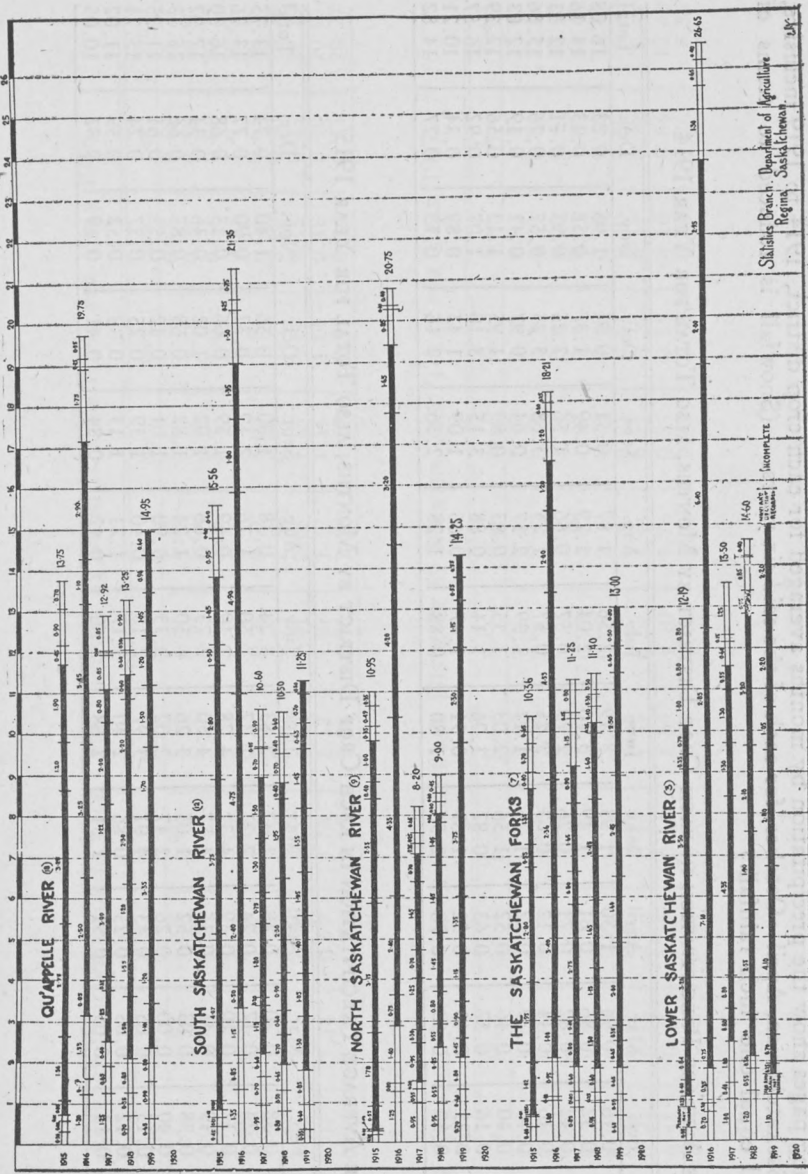


DIAGRAM SHOWING PRECIPITATION IN SASKATCHEWAN BY MONTHS ALSO AMOUNT DURING GROWING SEASON (APR - SEPT. INCLUSIVE)



Statistics Branch, Department of Agriculture
Regina, Saskatchewan

STATIONS

Qu'Appelle River

Caron.....
Estevan.....
Fort Qu'Appelle.....
Gladwin.....
Grenfell.....
Hubbard.....
Humboldt.....
Imperial.....
Indian Head.....
Kamsack.....
Manor.....

South Saskatchewan River

Chaplin.....
Coulee.....
Kindersley.....
Klintonel.....
Nashlyn.....

North Saskatchewan River

Anglia.....
Battelford.....
Lloydminster.....
Luseland.....

The Saskatchewan Forks

Halcyonia.....
Prince Albert.....
Saskatoon.....

Lower Saskatchewan River

Lost River.....
River House.....

The tables on the following pages show the precipitation by months averaged for each crop district, 1914 to 1919 inclusive, and the average rainfall for Saskatchewan, April—October, for each of the said six years. (Snowfall is reduced to terms of rainfall—ten inches snowfall equal one inch rainfall.)

TABLE SHOWING THE AVERAGE PRECIPITATION IN EACH CROP DISTRICT BY MONTHS, ALSO TOTAL FOR YEAR 1914

| 1914 | Jan. | Feb. | Mar. | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Total |
|----------------------|------|------|------|-------|------|------|------|------|-------|------|------|------|-------|
| 1. South Eastern .. | 1.40 | 0.16 | 0.94 | 1.30 | 1.93 | 3.19 | 2.56 | 1.87 | 0.51 | 0.91 | 1.08 | 0.23 | 16.08 |
| 2. Regina Weyburn .. | 1.00 | 0.32 | 0.86 | 0.61 | 1.49 | 3.70 | 2.04 | 1.29 | 0.49 | 1.37 | 0.56 | 0.43 | 14.16 |
| 3. South Central... | 0.83 | 0.42 | 0.82 | 0.71 | 0.26 | 2.79 | 0.57 | 0.66 | 1.56 | 2.25 | 0.95 | 0.71 | 12.53 |
| 4. South Western.. | 0.90 | 0.16 | 0.44 | 0.12 | 0.63 | 3.25 | 0.57 | 1.25 | 3.68 | 3.23 | 0.57 | 0.76 | 15.56 |
| 5. East Central .. | 1.32 | 0.40 | 0.79 | 0.62 | 1.76 | 1.17 | 1.39 | 2.37 | 0.64 | 0.97 | 0.41 | 0.19 | 12.03 |
| 6. Central..... | 0.72 | 0.40 | 0.46 | 0.52 | 1.56 | 2.03 | 1.35 | 0.83 | 0.89 | 1.95 | 1.12 | 0.56 | 12.39 |
| 7. West Central... | 1.07 | 0.16 | 0.57 | 0.63 | 0.82 | 3.06 | 1.14 | 0.88 | 3.15 | 3.10 | 1.07 | 0.92 | 16.57 |
| 8. North Eastern.. | 0.52 | 0.23 | 0.46 | 0.52 | 1.69 | 0.91 | 1.47 | 0.66 | 1.09 | 1.43 | 0.89 | 0.34 | 10.21 |
| 9. North Western.. | 0.61 | 0.20 | 0.68 | 0.78 | 2.56 | 1.80 | 0.88 | 1.28 | 2.36 | 2.16 | 0.75 | 0.77 | 14.82 |

TABLE SHOWING THE AVERAGE PRECIPITATION IN EACH CROP DISTRICT BY MONTHS, ALSO TOTAL FOR YEAR 1915

| 1915 | Jan. | Feb. | Mar. | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Total |
|----------------------|------|------|------|-------|------|------|------|------|-------|------|------|------|-------|
| 1. South Eastern .. | 0.36 | 0.38 | 0.20 | 0.49 | 1.37 | 2.83 | 3.24 | 0.38 | 1.80 | 0.56 | 1.40 | 0.74 | 13.75 |
| 2. Regina Weyburn .. | 0.29 | 0.24 | 0.17 | 0.24 | 2.21 | 2.37 | 2.50 | 1.26 | 2.49 | 0.32 | 0.90 | 0.77 | 13.76 |
| 3. South Central... | 0.34 | 0.12 | 0.10 | 0.39 | 4.31 | 4.28 | 3.19 | 0.49 | 1.59 | 0.66 | 0.15 | 0.68 | 16.30 |
| 4. South Western.. | 0.47 | 0.19 | 0.45 | 0.36 | 4.87 | 4.50 | 2.73 | 0.66 | 1.92 | 1.02 | 0.46 | 0.34 | 17.97 |
| 5. East Central .. | 0.34 | 0.38 | 0.03 | 0.52 | 1.05 | 3.26 | 4.50 | 1.24 | 1.82 | 0.68 | 0.85 | 0.66 | 15.33 |
| 6. Central..... | 0.40 | 0.40 | 0.00 | 0.26 | 2.47 | 2.02 | 2.33 | 0.90 | 1.01 | 0.42 | 0.53 | 0.61 | 11.35 |
| 7. West Central... | 0.30 | 0.15 | 0.05 | 0.43 | 4.01 | 3.97 | 2.18 | 0.40 | 1.39 | 0.25 | 0.37 | 0.24 | 13.74 |
| 8. North Eastern.. | 0.34 | 0.12 | 0.05 | 0.25 | 0.86 | 2.40 | 3.17 | 1.21 | 1.13 | 0.38 | 0.52 | 0.59 | 11.02 |
| 9. North Western.. | 0.08 | 0.14 | 0.05 | 0.51 | 1.31 | 2.68 | 2.60 | 0.42 | 0.84 | 0.41 | 0.49 | 0.52 | 10.05 |

TABLE SHOWING THE AVERAGE PRECIPITATION IN EACH CROP DISTRICT BY MONTHS, ALSO TOTAL FOR YEAR 1916

| 1916 | Jan. | Feb. | Mar. | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Total |
|---------------------|------|------|------|-------|------|------|------|------|-------|------|------|------|-------|
| 1. South Eastern... | 1.99 | 0.64 | 1.82 | 1.58 | 1.62 | 3.55 | 1.81 | 1.42 | 2.65 | 1.50 | 0.45 | 0.68 | 19.71 |
| 2. Regina Weyburn | 1.37 | 0.64 | 2.00 | 0.80 | 2.33 | 3.45 | 2.70 | 1.06 | 3.36 | 2.30 | 0.21 | 0.58 | 20.80 |
| 3. South Central... | 1.54 | 0.60 | 1.40 | 0.63 | 2.10 | 3.90 | 4.51 | 2.06 | 1.37 | 1.02 | 0.34 | 0.64 | 20.11 |
| 4. South Western... | 1.02 | 0.78 | 0.73 | 0.52 | 2.74 | 3.43 | 4.99 | 1.59 | 1.53 | 1.40 | 0.25 | 1.07 | 20.05 |
| 5. East Central... | 0.66 | 0.23 | 1.40 | 0.55 | 3.44 | 3.04 | 3.75 | 0.71 | 4.00 | 1.83 | 0.13 | 0.62 | 20.36 |
| 6. Central..... | 1.07 | 0.31 | 0.77 | 0.69 | 1.88 | 2.72 | 4.93 | 1.80 | 0.91 | 1.11 | 0.09 | 0.30 | 16.58 |
| 7. West Central... | 1.27 | 0.43 | 1.38 | 0.46 | 2.58 | 4.62 | 5.41 | 2.65 | 1.85 | 1.03 | 0.16 | 0.45 | 22.29 |
| 8. North Eastern... | 1.31 | 0.37 | 1.14 | 0.79 | 3.68 | 2.52 | 5.87 | 1.67 | 1.15 | 1.05 | 0.18 | 0.30 | 20.03 |
| 9. North Western.. | 1.15 | 0.06 | 1.09 | 0.99 | 3.15 | 3.93 | 4.03 | 2.88 | 1.57 | 0.95 | 0.14 | 0.33 | 20.27 |

TABLE SHOWING THE AVERAGE PRECIPITATION IN EACH CROP DISTRICT BY MONTHS, ALSO TOTAL FOR YEAR 1917

| 1917 | Jan. | Feb. | Mar. | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Total |
|---------------------|------|------|------|-------|------|------|------|------|-------|------|------|------|-------|
| 1. South Eastern... | 1.04 | 0.95 | 0.87 | 2.85 | 0.30 | 2.60 | 2.17 | 1.43 | 1.12 | 1.30 | 0.13 | 1.17 | 15.93 |
| 2. Regina Weyburn | 1.59 | 0.81 | 0.60 | 0.94 | 0.28 | 2.49 | 0.90 | 2.17 | 0.86 | 1.24 | 0.13 | 0.85 | 12.86 |
| 3. South Central... | 0.58 | 0.68 | 0.61 | 1.35 | 0.06 | 2.51 | 0.74 | 1.51 | 1.34 | 0.84 | 0.03 | 0.46 | 10.68 |
| 4. South Western... | 0.83 | 0.61 | 0.68 | 1.16 | 0.35 | 1.71 | 0.27 | 1.85 | 1.67 | 1.81 | 0.03 | 1.63 | 12.60 |
| 5. East Central... | 2.09 | 0.64 | 0.37 | 0.62 | 0.39 | 3.30 | 0.69 | 2.42 | 0.73 | 0.68 | 0.06 | 0.88 | 12.87 |
| 6. Central..... | 1.16 | 0.45 | 0.51 | 0.83 | 0.44 | 2.58 | 1.03 | 1.62 | 0.93 | 0.47 | 0.10 | 0.58 | 9.70 |
| 7. West Central... | 0.77 | 0.44 | 0.18 | 0.90 | 0.38 | 1.27 | 0.92 | 1.95 | 0.72 | 0.29 | 0.17 | 0.72 | 8.71 |
| 8. North Eastern... | 0.71 | 0.48 | 0.45 | 0.62 | 0.35 | 3.09 | 1.10 | 1.76 | 0.75 | 0.35 | 0.10 | 0.64 | 10.40 |
| 9. North Western.. | 0.91 | 0.18 | 0.45 | 0.80 | 0.40 | 1.77 | 0.48 | 1.21 | 0.67 | 0.53 | 0.18 | 0.76 | 8.34 |

TABLE SHOWING THE AVERAGE PRECIPITATION IN EACH CROP DISTRICT BY MONTHS, ALSO TOTAL FOR YEAR 1918

| 1918 | Jan. | Feb. | Mar. | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Total |
|----------------------|------|------|------|-------|------|------|------|------|-------|------|------|------|-------|
| 1. South Eastern .. | 1.07 | 0.55 | 0.67 | 1.14 | 1.60 | 1.39 | 2.09 | 2.78 | 1.00 | 0.68 | 0.41 | 1.17 | 14.55 |
| 2. Regina Weyburn .. | 0.75 | 0.52 | 0.85 | 2.02 | 1.37 | 1.21 | 2.09 | 2.47 | 0.63 | 0.53 | 0.48 | 0.84 | 13.76 |
| 3. South Central... | 0.97 | 0.60 | 1.45 | 0.98 | 0.86 | 1.45 | 1.67 | 1.47 | 0.45 | 0.94 | 0.45 | 0.77 | 12.06 |
| 4. South Western... | 1.02 | 1.02 | 0.50 | 0.87 | 0.28 | 0.68 | 0.96 | 1.53 | 0.46 | 0.61 | 0.44 | 0.54 | 8.91 |
| 5. East Central... | 0.76 | 0.39 | 1.37 | 0.66 | 2.00 | 1.56 | 3.25 | 2.19 | 0.51 | 0.64 | 0.08 | 0.98 | 14.39 |
| 6. Central..... | 0.76 | 0.25 | 0.53 | 1.39 | 3.05 | 0.87 | 2.20 | 1.51 | 0.22 | 0.52 | 0.15 | 0.70 | 12.15 |
| 7. West Central... | 0.79 | 0.37 | 0.70 | 0.42 | 0.64 | 0.51 | 1.74 | 2.28 | 0.24 | 0.45 | 0.24 | 0.38 | 8.76 |
| 8. North Eastern.. | 0.60 | 0.16 | 0.86 | 1.39 | 1.46 | 1.08 | 2.01 | 1.44 | 0.34 | 0.69 | 0.04 | 0.59 | 10.66 |
| 9. North Western.. | 1.08 | 0.23 | 0.98 | 0.92 | 2.78 | 1.35 | 1.30 | 1.00 | 0.24 | 0.42 | 0.20 | 0.56 | 9.06 |

TABLE SHOWING THE AVERAGE PRECIPITATION IN EACH CROP DISTRICT BY MONTHS, ALSO TOTAL FOR YEAR 1919

| 1919 | Jan. | Feb. | Mar. | April | May | June | July | Aug. | Sept. | Oct. | Nov. | Dec. | Total |
|----------------------|------|------|------|-------|------|------|------|------|-------|------|------|------|-------|
| 1. South Eastern .. | 0.47 | 1.03 | 0.61 | 1.87 | 1.78 | 2.58 | 2.40 | 1.47 | 1.12 | 1.39 | 1.25 | 0.66 | 16.63 |
| 2. Regina Weyburn .. | 0.57 | 1.15 | 0.88 | 1.35 | 0.90 | 2.75 | 1.78 | 1.24 | 0.91 | 1.21 | 0.89 | 0.42 | 14.05 |
| 3. South Central... | 0.51 | 0.88 | 0.60 | 1.22 | 1.01 | 1.56 | 1.10 | 1.78 | 0.87 | 0.88 | 0.46 | 0.13 | 11.00 |
| 4. South Western... | 0.35 | 0.58 | 0.72 | 1.15 | 1.16 | 1.79 | 0.44 | 0.54 | 1.60 | 0.57 | 0.92 | 0.38 | 10.20 |
| 5. East Central... | 0.81 | 0.84 | 0.60 | 0.88 | 1.65 | 4.18 | 1.87 | 1.61 | 1.47 | 0.93 | 0.91 | 0.74 | 16.49 |
| 6. Central..... | 0.46 | 0.26 | 1.01 | 0.74 | 0.33 | 2.10 | 1.33 | 1.76 | 1.78 | 0.49 | 0.41 | 0.22 | 10.89 |
| 7. West Central... | 0.96 | 0.70 | 1.13 | 0.92 | 1.03 | 1.17 | 1.40 | 3.13 | 1.67 | 0.97 | 0.48 | 0.32 | 13.88 |
| 8. North Eastern.. | 0.89 | 0.27 | 0.85 | 0.43 | 0.85 | 3.55 | 1.52 | 2.22 | 2.07 | 0.99 | 0.54 | 0.58 | 14.86 |
| 9. North Western.. | 0.66 | 0.52 | 0.60 | 0.18 | 0.59 | 1.16 | 1.47 | 2.99 | 2.47 | 1.13 | 0.73 | 0.74 | 13.24 |

PRECIPITATION IN SASKATCHEWAN

Total Rainfall for the Year in Each Crop District, also average for six years

| Crop District No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1914..... | 16.08 | 14.16 | 12.53 | 15.56 | 12.03 | 12.39 | 16.57 | 10.21 | 14.82 |
| 1915..... | 13.75 | 13.76 | 16.30 | 17.97 | 15.33 | 11.35 | 13.74 | 11.02 | 10.05 |
| 1916..... | 19.71 | 20.80 | 20.11 | 20.05 | 20.36 | 16.58 | 22.29 | 20.03 | 20.27 |
| 1917..... | 15.93 | 12.86 | 10.68 | 12.60 | 12.87 | 9.70 | 8.71 | 10.40 | 8.34 |
| 1918..... | 14.55 | 13.76 | 12.06 | 8.91 | 14.39 | 12.15 | 8.76 | 10.66 | 9.06 |
| 1919..... | 16.63 | 14.05 | 11.00 | 10.20 | 16.49 | 10.89 | 13.88 | 14.86 | 13.24 |
| Six year average.... | 16.11 | 14.90 | 13.78 | 14.21 | 15.24 | 12.17 | 13.99 | 12.86 | 12.63 |

Total Rainfall April to October, inclusive, by Crop Districts, also average for six years

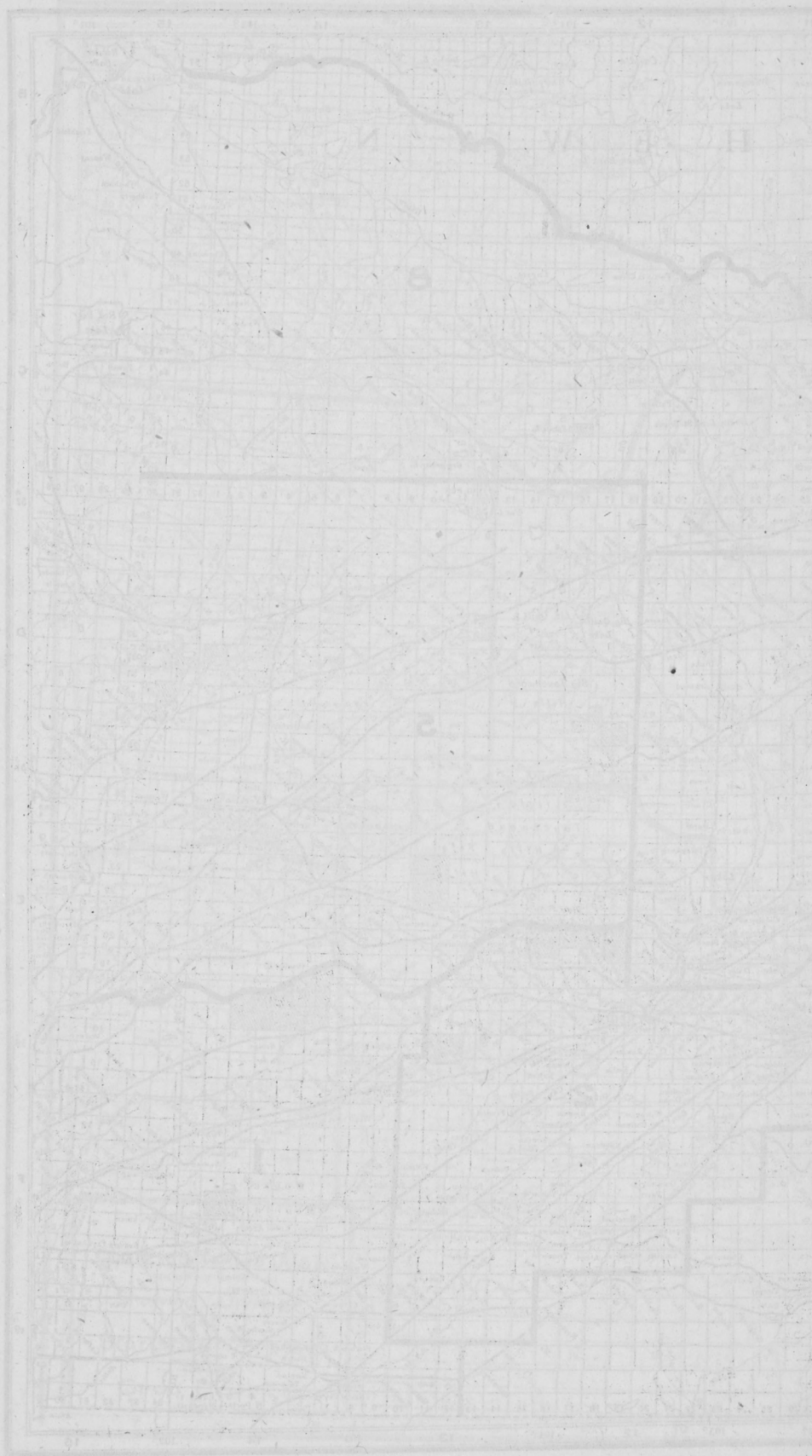
| Crop District No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|----------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1914..... | 12.27 | 10.99 | 8.80 | 12.73 | 8.92 | 9.13 | 12.78 | 7.77 | 11.82 |
| 1915..... | 10.67 | 11.39 | 14.91 | 16.06 | 13.07 | 9.41 | 12.63 | 9.40 | 8.77 |
| 1916..... | 14.13 | 16.00 | 15.59 | 16.20 | 17.32 | 14.04 | 18.60 | 16.73 | 17.50 |
| 1917..... | 11.77 | 8.88 | 8.35 | 8.82 | 8.83 | 7.90 | 6.43 | 8.02 | 5.86 |
| 1918..... | 10.68 | 10.32 | 7.82 | 5.99 | 10.81 | 9.76 | 6.28 | 8.41 | 8.01 |
| 1919..... | 12.61 | 10.41 | 8.42 | 7.25 | 12.59 | 8.53 | 10.29 | 11.73 | 9.99 |
| Six year average.... | 12.02 | 11.28 | 10.64 | 11.07 | 11.92 | 9.79 | 11.16 | 10.34 | 10.32 |

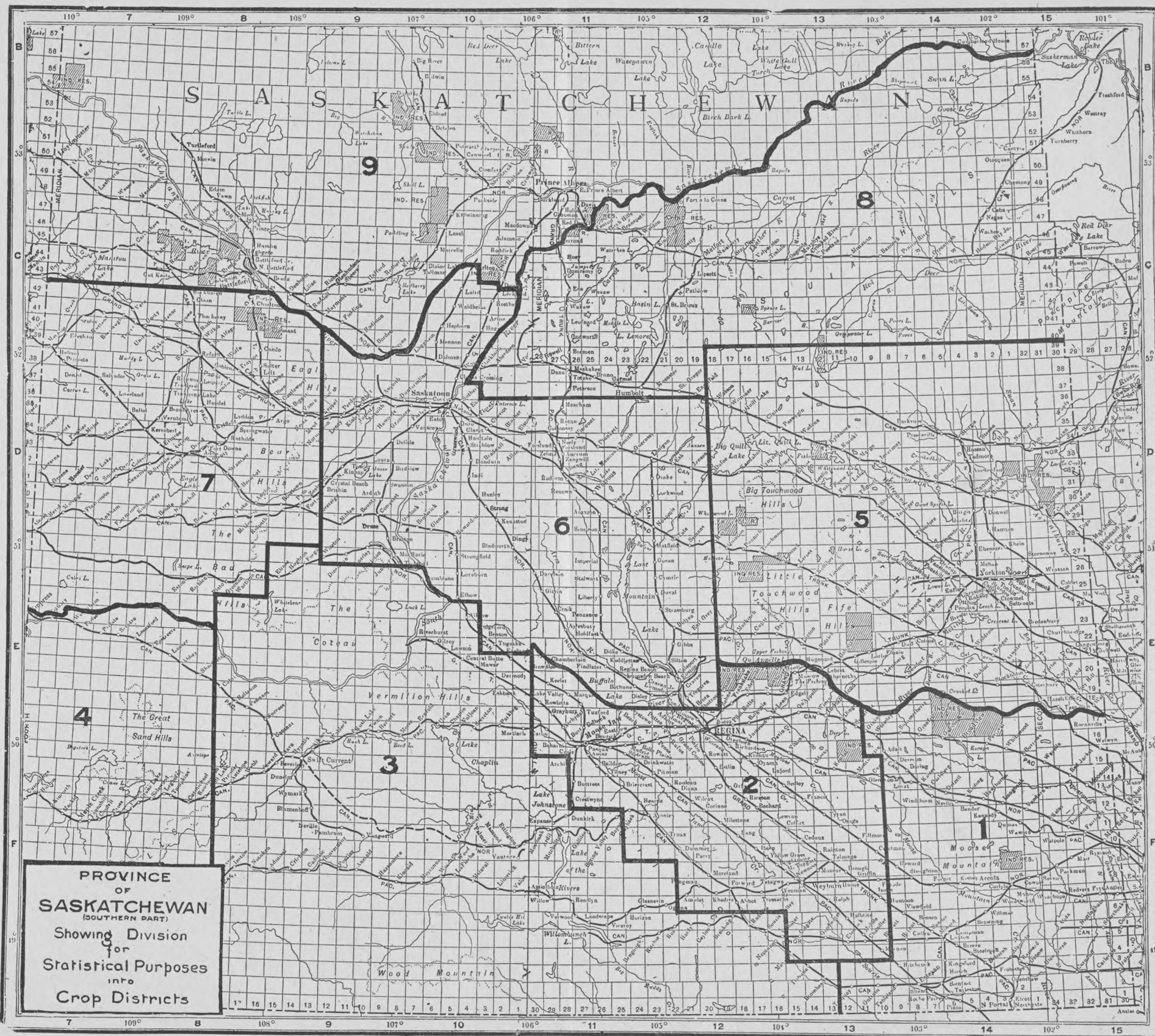
ADDITIONAL PRECIPITATION RECORDS

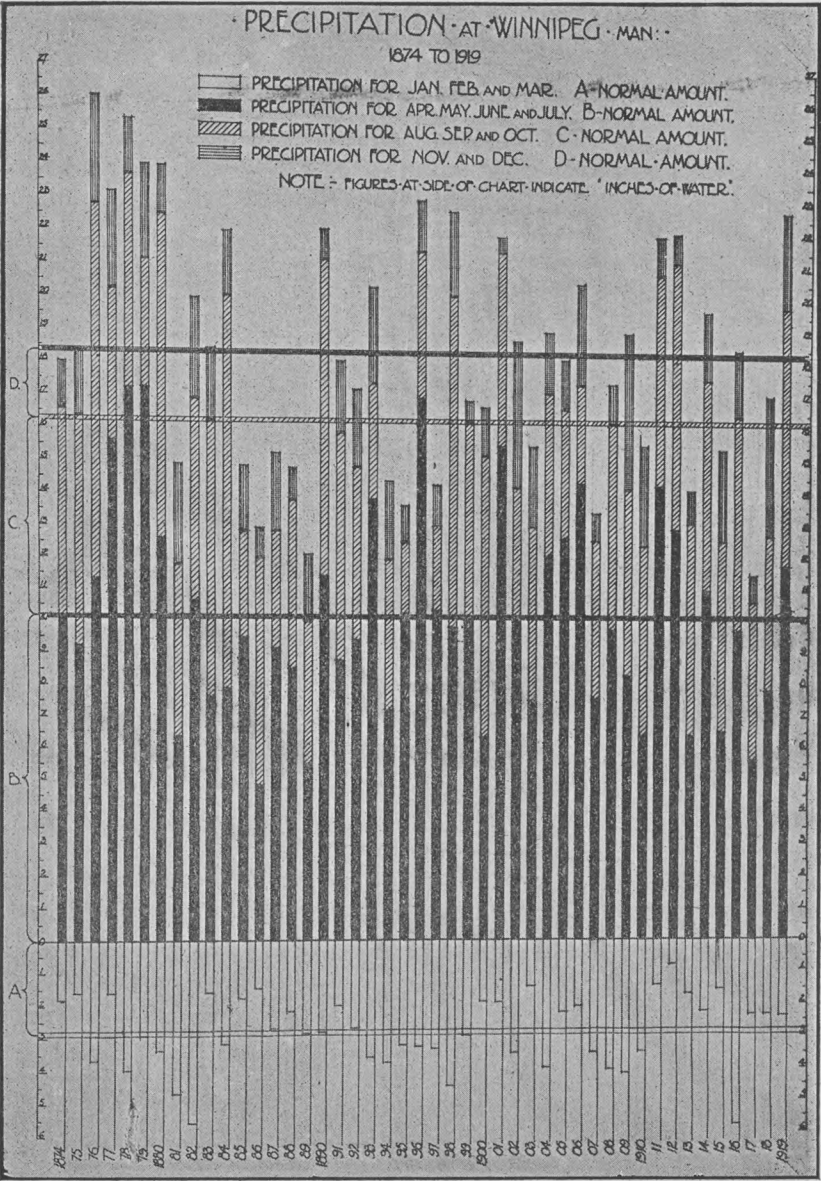
The following cuts show precipitation records at Swift Current, Battleford, Qu'Appelle, Winnipeg, Medicine Hat, Calgary and Edmonton, and constitute a very valuable record for comparative study, as records have been kept at most of these points for approximately 35 years, and at Winnipeg for 10 years longer.

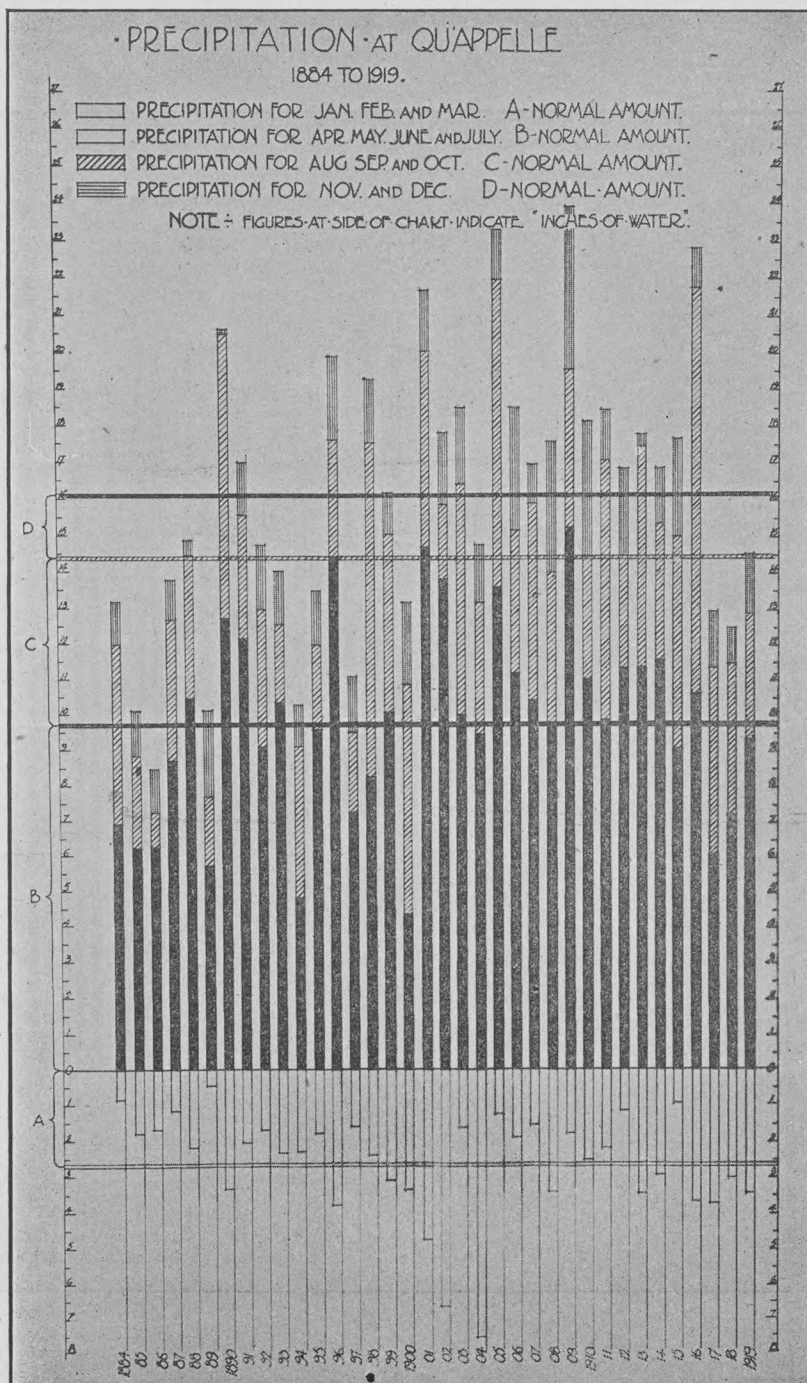
HAVRE PRECIPITATION RECORD

The precipitation records for Havre, Montana, for the past 40 years are interesting because of the proximity of Havre to southwestern Saskatchewan, and because the length of the record which corresponds closely with similar data for Swift Current and Medicine Hat. Perhaps the most encouraging feature is the fact that only during the years 1917-18-19 are there three very dry years in succession. There were, however, three separate occasions when at Havre there were two dry years in succession and several single dry seasons.





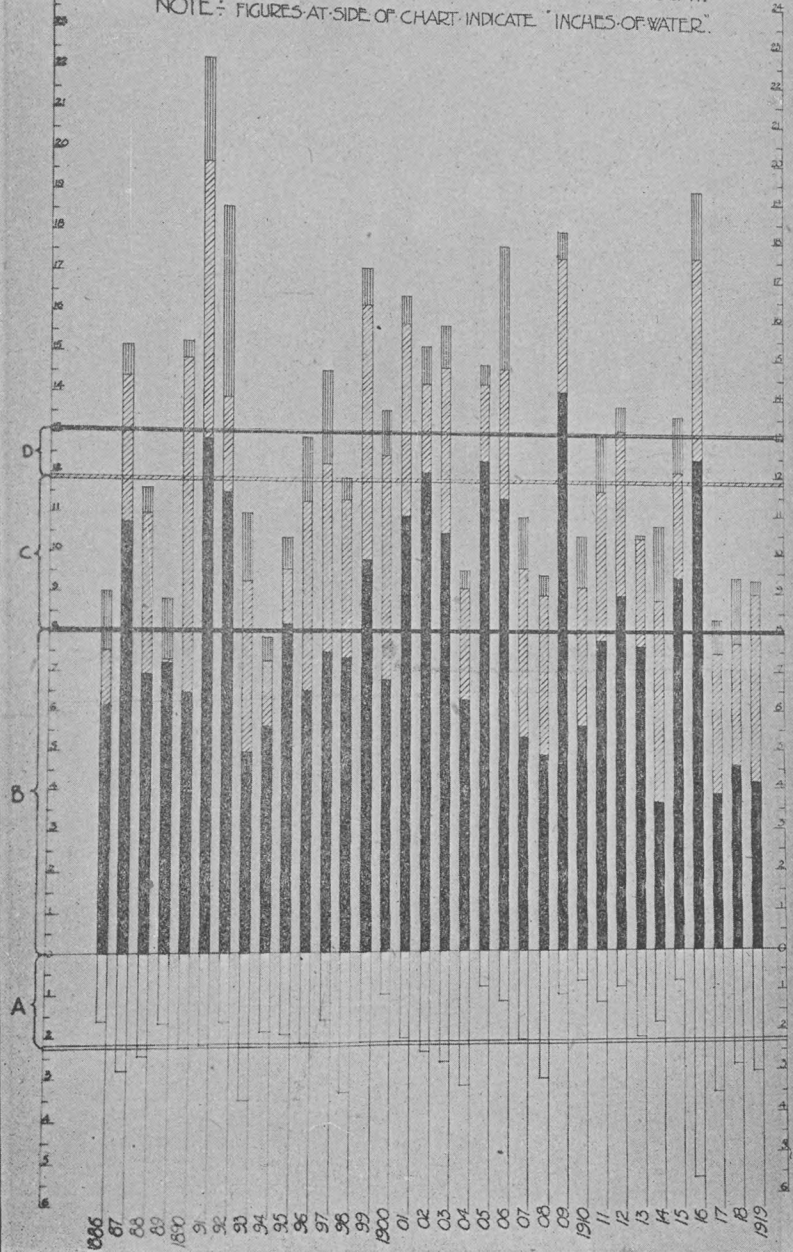




• PRECIPITATION • AT • SWIFT • CURRENT • SASK. • • 1886 TO 1919 •

- PRECIPITATION FOR JAN. FEB. AND MAR. A-NORMAL AMOUNT.
- PRECIPITATION FOR APR. MAY, JUNE AND JULY. B-NORMAL AMOUNT.
- PRECIPITATION FOR AUG. SEP. AND OCT. C-NORMAL AMOUNT.
- PRECIPITATION FOR NOV. AND DEC. D-NORMAL AMOUNT.

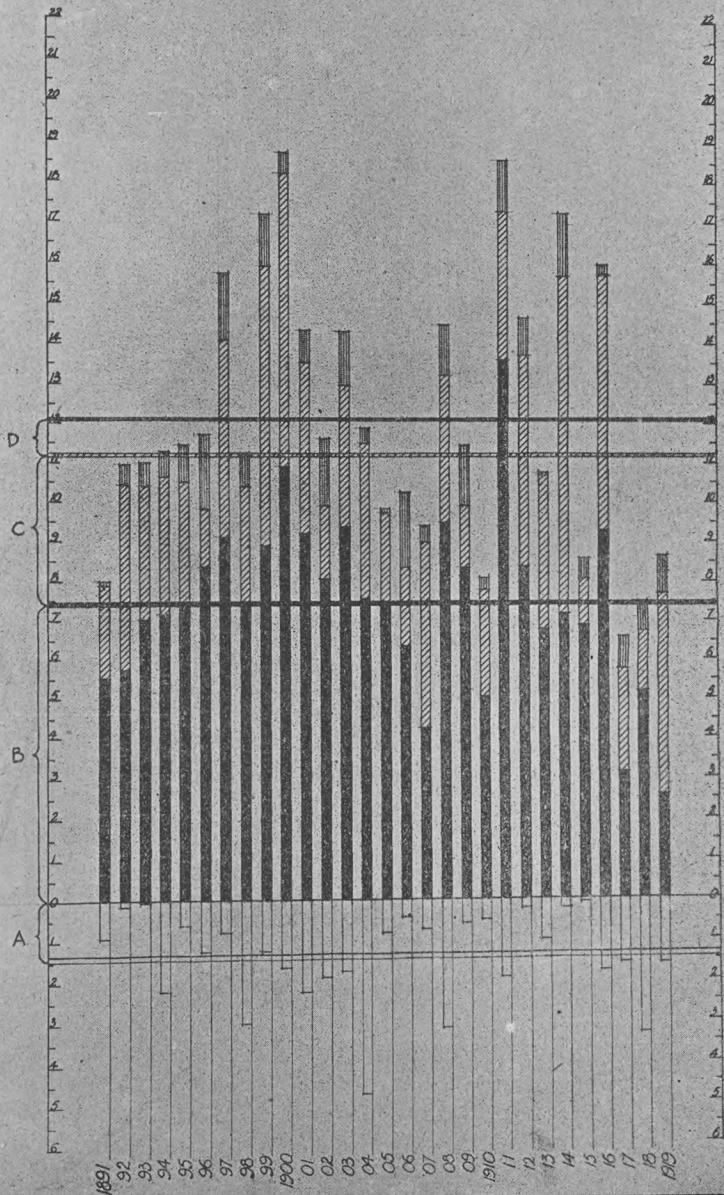
NOTE: FIGURES AT SIDE OF CHART INDICATE "INCHES OF WATER".



PRECIPITATION AT BATTLEFORD, SASK.
1891 TO 1919.

- [White bar] PRECIPITATION FOR JAN. FEB. AND MAR. A-NORMAL AMOUNT.
 [Dark shaded bar] PRECIPITATION FOR APR. MAY, JUNE AND JULY. B-NORMAL AMOUNT.
 [Diagonal lines bar] PRECIPITATION FOR AUG. SEP. AND OCT. C-NORMAL AMOUNT.
 [Horizontal lines bar] PRECIPITATION FOR NOV. AND DEC. D-NORMAL AMOUNT.

NOTE: FIGURES AT SIDE OF CHART INDICATE "INCHES OF WATER."

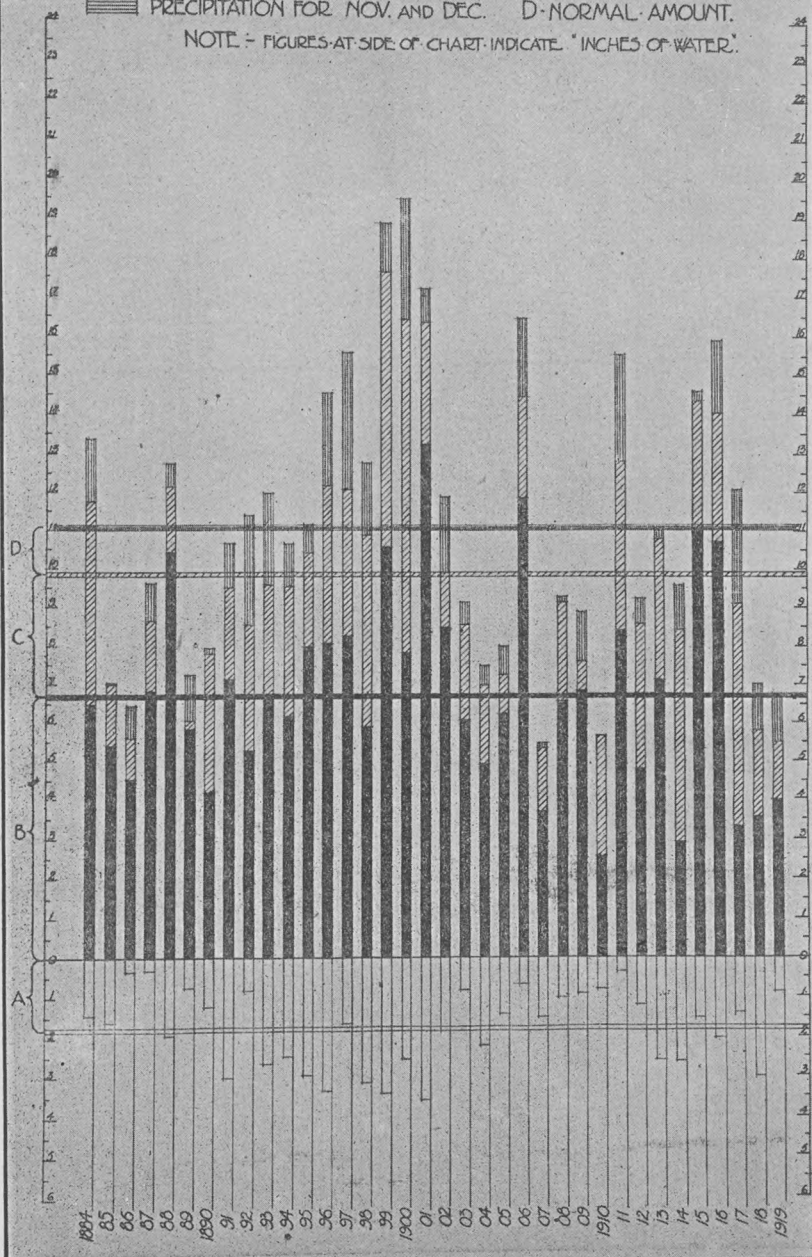


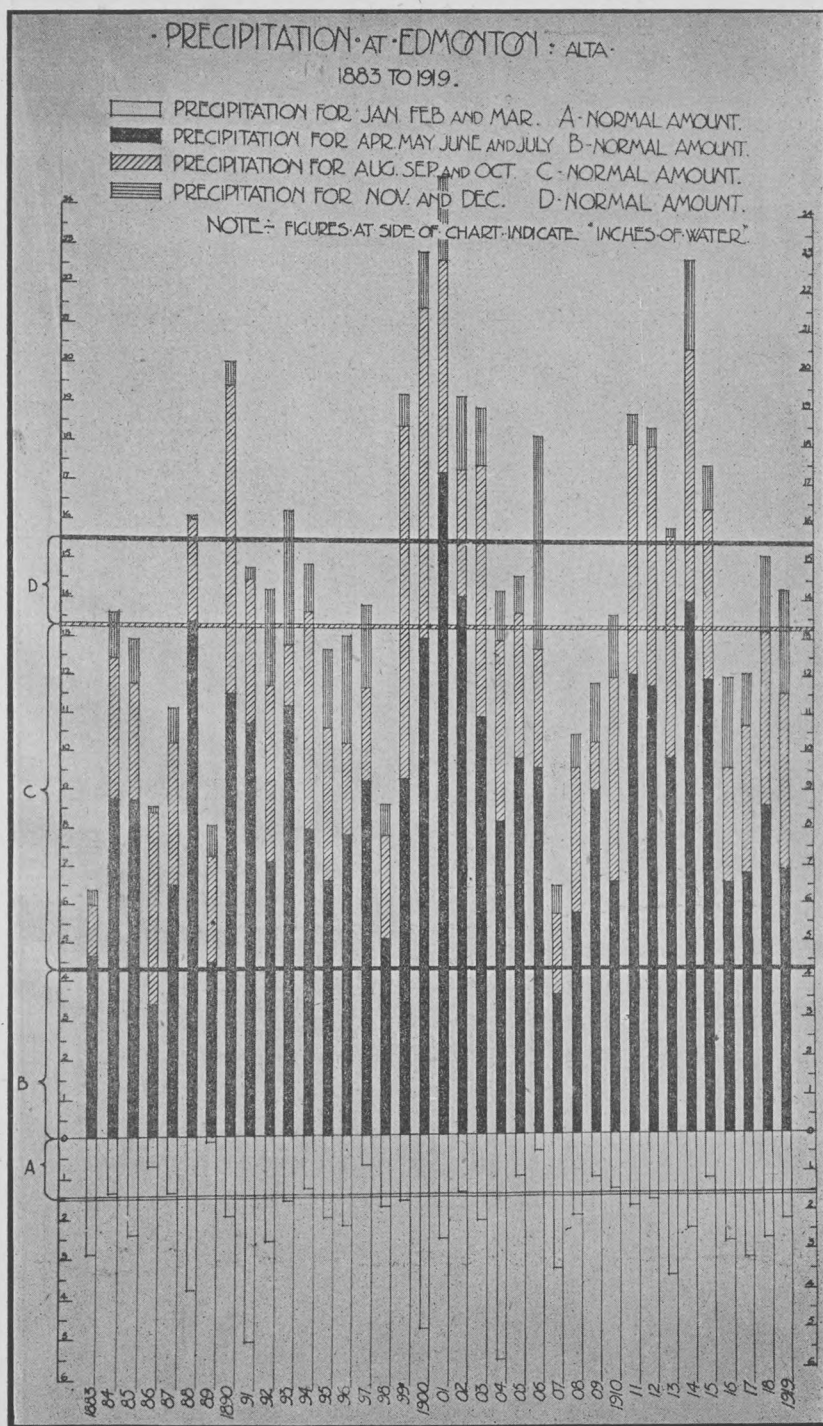
PRECIPITATION AT MEDICINE HAT ALTA:

1884 TO 1919.

- PRECIPITATION FOR JAN. FEB. AND MAR. A-NORMAL AMOUNT.
- PRECIPITATION FOR APR. MAY, JUNE AND JULY B-NORMAL AMOUNT.
- ▨ PRECIPITATION FOR AUG. SEP. AND OCT. C-NORMAL AMOUNT.
- ▤ PRECIPITATION FOR NOV. AND DEC. D-NORMAL AMOUNT.

NOTE - FIGURES AT SIDE OF CHART INDICATE "INCHES OF WATER."





• PRECIPITATION AT CALGARY, ALTA.

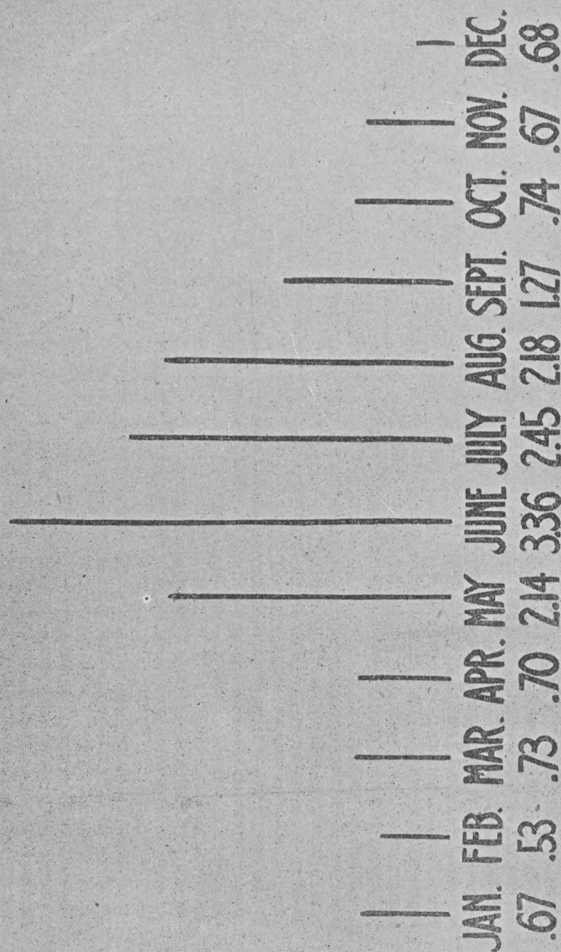
1855 TO 1919.

- [] PRECIPITATION FOR JAN. FEB. AND MAR. A-NORMAL AMOUNT.
 [] PRECIPITATION FOR APR. MAY, JUNE AND JULY. B-NORMAL AMOUNT.
 [] PRECIPITATION FOR AUG. SEP. AND OCT. C-NORMAL AMOUNT.
 [] PRECIPITATION FOR NOV. AND DEC. D-NORMAL AMOUNT.

NOTE: FIGURES AT SIDE OF CHART INDICATE "INCHES OF WATER".



Average Monthly Distribution of Precipitation in
Saskatchewan - 9 Places for 11 years ('04 to '14)



Average Annual 16.13

RECOMMENDATIONS *re* ACQUIRING PRECIPITATION RECORDS

Records of temperature and rain-fall have assumed a new importance to farmers during recent years on account of the far reaching effect of these two climatic factors upon crop production. It is the opinion of your Commissioners that some of the more recently settled portions of Saskatchewan contain too few meteorological stations. Precipitation records are not sufficiently full and complete. Rains are frequently very local in their effect and consequently either do not appear in the records at all or give an exaggerated impression of their importance. It is therefore, considered desirable that in the western part of Saskatchewan the number of reporting stations should be more numerous than they are and that throughout the province there should be a precipitation reporting station in each rural municipality.

Your Commissioners, therefore, recommend that the Dominion Meteorological Service be requested to obtain records from a sufficient number of points in this area to enable resident farmers and those engaged in experimental agriculture in behalf of the province to know exactly the climatic conditions under which they are laboring.

AGRICULTURAL AND LIVE STOCK DEVELOPMENT OF SOUTHWESTERN SASKATCHEWAN, 1901 TO 1920

In order to appraise the agricultural possibilities of Southwestern Saskatchewan, it is desirable that its record of production be studied somewhat closely. The Dominion census returns for each of the five year periods beginning with 1901, unfortunately do not afford a basis for exact comparison, as the boundaries of the electoral divisions for which figures are available, have been altered during that time. The census records of 1901 and 1906 are for the same area—Western Assiniboia, which formed a rectangle bordered on the south by the United States, on the east by range 15, west of the 2nd meridian, on the north by township 35 and extended west into what is now the province of Alberta a distance of 60 miles, or to about 30 miles west of Medicine Hat.

The figures quoted from the census of 1911 are for the former electoral division of Moose Jaw, an area smaller than that covered by the district of West Assiniboia by some 21,000,000 acres. The 1916 figures are for the existing electoral divisions of Maple Creek, Swift Current, Moose Jaw and Kindersley, which extend 35 miles farther north than the district for which the 1911 census figures are quoted, but comprise a territory smaller by 9,600,000 acres than the area covered by 1901 and 1906 figures. With this explanation, conclusions from the following figures may be intelligently drawn and a comparison made of the development of Southwestern Saskatchewan in live stock, in population, in farms, in crop area and in crop production in the five year periods from 1901 to 1916.

LIVE STOCK IN SOUTHWESTERN SASKATCHEWAN

| Year | Horses | Cattle | Sheep | Swine | Total |
|------|---------|---------|---------|---------|---------|
| 1901 | 25,160 | 82,358 | 62,777 | 4,820 | 175,115 |
| 1906 | 63,096 | 132,935 | 105,440 | 19,564 | 321,035 |
| 1911 | 114,304 | 121,707 | 89,052 | 30,784 | 355,847 |
| 1916 | 299,458 | 249,100 | 62,749 | 152,704 | 764,011 |

POPULATION AND FARMS

| Year | Population | Farms | Area of Farms | Area in Crop |
|------|------------|--------|---------------|--------------|
| 1901 | 17,692 | 2,436 | 927,512 | 123,790 |
| 1906 | 46,560 | 8,750 | | 532,479 |
| 1911 | 87,725 | 23,297 | 8,078,070 | 820,463 |
| 1916 | 178,200 | 37,954 | 13,913,603 | 4,473,038 |

YIELD OF CROPS IN BUSHELS

| Year | Wheat | Oats | Barley | Flax |
|------|------------|------------|-----------|-----------|
| 1900 | 1,008,025 | 404,654 | 14,078 | 68 |
| 1905 | 6,046,188 | 4,863,547 | 71,168 | 74,026 |
| 1910 | 7,142,134 | 3,718,313 | 85,224 | 649,019 |
| 1915 | 96,159,364 | 43,580,944 | 1,648,782 | 4,435,153 |

The figures quoted show that Southwest Saskatchewan under a system of grain growing or mixed farming was sustaining in 1916 an enormously greater number of persons and live stock than a considerably larger area sustained in 1901 or in 1906. It is only fair to the comparison, however, to point out that the adverse crop seasons of 1917-1918 and 1919 brought about to some extent a forced liquidation of live stock. This was due partly to the necessity of selling something to provide revenue when crops were short, partly to the shortage of fodder and the limited funds with which to purchase it, and also to the prospect of loss from feeding high priced grain to meat animals.

It is interesting, however, to note the following figures for crop districts 3 and 4, compiled jointly by the census office, Ottawa, and the Saskatchewan Department of Agriculture. These crop districts cover practically the same area as the electoral divisions of Moose Jaw, Swift Current and Maple Creek, to which the figures for 1911 herein quoted relate, but are much less than the area to which the 1916 census figures relate.

LIVE STOCK IN CROP DISTRICTS 3 AND 4 1918-1920

| Year | Horses | Cattle | Sheep | Swine |
|------|---------|---------|--------|---------|
| 1918 | 297,301 | 269,264 | 35,305 | 116,327 |
| 1919 | 316,478 | 279,560 | 34,213 | 96,484 |
| 1920 | 253,138 | 259,008 | 40,669 | 63,597 |

These figures show that the reduction of live stock in this district since 1916 has not been marked, with the exception of hogs.

Owing to the fact that in 1916 there were many homesteaders in the Southwest who had only begun their duties, it is evident that many farms in that area were not stocked to any extent and that when agriculture is more fully developed and a safer system established, it will be found that the stock carrying capacity of the region will continue to increase. One brood sow on each of the 29,352 farms in crop districts 3 and 4 with an average of only five pigs per litter, would mean fifty per cent. more pork than has ever been raised in that region. This should

be a safe minimum, and indicates clearly the great possibilities of future production in this class of live stock, while an even greater expansion is possible in the raising of sheep.

To complete the record of production of this area down to date the following statement of grain produced in crop districts 3 and 4 for each year from 1916 to 1920 is shown:

CEREAL PRODUCTION FOR CROP DISTRICTS NOS. 3 AND 4
1916-1920

| Year | Wheat | Oats | Barley | Flax | Rye |
|------|------------|------------|-----------|-----------|---------|
| 1916 | 26,515,931 | 22,522,364 | 766,305 | 1,890,977 | — |
| 1917 | 21,921,525 | 14,102,970 | 786,266 | 1,445,568 | — |
| 1918 | 20,052,730 | 18,416,123 | 1,815,609 | 2,260,910 | 417,108 |
| 1919 | 17,741,447 | 12,584,043 | 537,903 | 2,009,981 | 433,543 |
| 1920 | 32,551,117 | 23,919,544 | 704,927 | 2,924,438 | 965,607 |

TILLAGE METHODS IN VOGUE IN SOUTHWEST SASKATCHEWAN AND RESULTING CONDITIONS

The "summerfallow" method of using the precipitation of three years to grow two crops, or of two years to grow one crop, has made possible the growing of grain in areas in which it is doubtful whether any other system of tillage and cropping would have produced equally good results. To "summerfallow" has meant to plow the land late in May or early in June and keep it free from vegetation during the remainder of the year so that what rain falls on it is absorbed by it and a considerable portion retained as a surplus for the next year's crop. Some variations have been introduced to meet local conditions, but the foregoing still describes the approved method as generally practised.

The first tillage operation, however, is that of "breaking" the prairie. Two methods are followed, namely deep breaking and shallow breaking, the latter being the first operation in "backsetting." "Deep breaking" is taken to mean plowing to a depth of from four to five inches. When the furrow slice is sufficiently rotted that it can be discd without turning up unrotted sod, it is cultivated to make a good seed bed and to kill any remaining vegetation. Shallow breaking means plowing to a depth of from two to four inches, leaving the sod flat to rot, and "backsetting" or laying it over again by plowing a couple of inches below the sod so as to expose fresh soil to make a mellow seed bed. In districts where the sod is not grassy and is easily tilled, "deep" breaking is the method commonly practised.

The early efforts of the homesteader have had to do with breaking up the prairie and destroying native vegetation so as to have a place in which to grow crops. Soon, however, he has to consider what is the most profitable method of treating stubble land, and this introduces the summerfallow and with it comes some of the problems of the summerfallow.

For over thirty years, the summerfallow once in three years has been the practice upon which successful grain growing has been carried on in Eastern and Central Saskatchewan. Until this plan of storing moisture was devised, crop failure was as frequent and just as serious in the eastern part of the province as it is now in the southwest. But while it stabilised grain growing it was learned that when the root fibres

of the native prairie plants had been worked out or destroyed by frequent plowing and cultivating, the land developed a tendency to blow and drift, and this has been the history of most open plains districts where grain growing has been carried on for a dozen years or so, while some have reached this stage much sooner. The southwest being more recently settled than any other part of Saskatchewan should not yet experience soil drifting, but this has developed in some districts, and it may therefore be assumed that the soils which have already proved very troublesome in this respect are naturally deficient in fibre, and that provision will have to be made to restore organic matter if these soils are to continue in use for grain production according to prevailing methods. Soil drifting is one of the most serious conditions in connection with grain growing on the lighter soils in Saskatchewan and calls for immediate action.

What the cure will be is not fully apparent. Fallow substitutes as outlined by Professor Champlin in an address before the Better Farming Conference at Swift Current in July last seems to offer a feasible solution and are dealt with in the chapter in which is outlined "A System of Farm Management for Southwest Saskatchewan." To say that they will be a complete solution is premature at this time, but they should at least be tried carefully and thoroughly.

IRRIGATION DEVELOPMENT

Irrigation of land in Southwestern Saskatchewan has been developed principally in the area in and tributary to the Cypress Hills. The present irrigable area is 50,137 acres. Additional irrigation can be developed by building reservoirs and storing water through which about 50,000 acres more may be irrigated.

The present irrigated areas are used mainly in raising forage crops. Future extensions are likely to lie in the same direction, and as the topography of the country prevents a general use of stream waters for the irrigation of areas in excess of approximately 100,000 acres (which is equivalent to less than five townships), it will be readily seen that irrigation will be a minor factor in grain growing in Southwestern Saskatchewan, especially as the available water can be used to greater advantage in raising forage crops.

DAIRYING

A creamery was built at Maple Creek in 1897, but owing to limited patronage was closed in the fall of 1901. In recent years there has been an awakening in the district to the value and reliability of dairying, and a creamery is again in operation there, and is doing a good business. The same is true of Swift Current, where a creamery has been operating very successfully during the past three years.

The advantages of dairying have never been better demonstrated than during the past three years when crops were poor and the income from grain growing slim and uncertain. During the years 1919 and 1920, the creameries at Maple Creek and Swift Current have paid to farmers of the surrounding territory approximately \$225,000 cash for cream. These men who had a few milch cows, a flock of hens, and a pig or two were immeasurably better off than those who had none of these to bring in a little money regularly to provide groceries and living necessities.

Distance from railway is a serious handicap for men who are in the dairy business, but the courageous and self reliant spirit which has been shown by those who in spite of such handicaps have "carried on" is worthy of all praise. Much can no doubt be done by cooperation in delivering cream, so that each patron making one trip to town a week or even less frequently would insure production and delivery of good quality cream.

GRAZING LANDS

Southwestern Saskatchewan is still the centre of the live stock ranching industry in Saskatchewan, although the range has been narrowed down to a relatively small area since homesteaders began to encroach upon what had until then been the rancher's domain.

Crown land held under grazing lease south of the Saskatchewan river and west of Moose Jaw comprises approximately 2,325,560 acres, of which only a small proportion is in forest reserves.

Leaseholders pay an annual rental to the Government of Canada at the rate of 4 cents per acre, and such land is subject to taxation at an assessment valuation not exceeding \$2.00 per acre. Users of forest reserves are charged at the rate of from five to ten cents per month for each head of cattle or horses, with a minimum of twenty-five cents. This may be increased to twenty-five cents per head per month if the area is fenced, or \$1.50 for the season. School lands rent at ten cents per acre per annum regardless of grazing value. Leases of Crown Lands, other than school lands and forest reserves, are now granted on a ten year basis.

Deeded land is not used to any considerable extent for ranching purposes, as the opinion seems to be generally held that municipal and school taxation is too high and interest charges on land prices too great to permit of the profitable use of such land for extensive grazing of live stock. Whether this be true or not it is apparent that there is a serious difference in the cost of grazing land. Deeded land used for this purpose if valued at, let us say, \$15.00 per acre, entails an annual "overhead" of \$1.20 per acre for interest. Such land would probably be taxed \$30.00 to \$35.00 per quarter section for municipal, school and public revenue support, or about 20 cents per acre—a total of \$1.40 per acre per annum, exclusive of special levies for telephones, hospitals, or other purposes. School lands are rented at 10 cents per acre. Taxes would make an additional cost of 3 cents, or a total of 13 cents per acre per annum. Leased land costs 4 cents per acre and an average of 3 cents per acre for taxes, or a total of 7 cents per acre per annum. Users of forest reserves pay per animal and not per acre. Summarising the foregoing gives the following comparative figures:

| | |
|--------------------------|----------------------------|
| Cost of deeded land..... | \$1.40 per acre per annum. |
| Cost of school land..... | .13 per acre per annum. |
| Cost of leased land..... | .07 per acre per annum. |

Allowing twenty acres per animal for grazing, the annual cost for grazing a horse or cow would be:

| | |
|------------------------------------|---------------------|
| On deeded land..... | \$28.00 per animal. |
| On school land..... | 2.60 per animal. |
| On leased land..... | 1.40 per animal. |
| On forest reserves, a maximum of.. | 1.50 per animal. |

That the remedy will be found in a reduction of taxation of grazing lands alone is unlikely, although that measure would afford some relief and should receive consideration by all assessors. That deeded lands cannot under any circumstances be used profitably for grazing stock has not been demonstrated, although it is admitted that there would be but little, if any, margin of profit on the basis of present costs of raising beef. But one has to remember also that land used for grain growing does not always produce enough to cover interest on the cost of the land after costs of operation are paid. There are lean years in every line of activity, and if farmers close down every time they have a bad year or business men quit whenever they lose money there would be little progress or permanence in the country, and a permanent and regular supply as well as a stable and constant demand are needed to maintain steady and dependable markets for any commodity. Complaint is sometimes made that land is being cropped which should have been kept for grazing. Perhaps it would be well to consider whether too high assessment and taxation of land only suitable for grazing purposes does not induce owners to break it up in the hope of getting a greater return from it. If so, a rate of taxation consistent with the producing value of the land should be an encouragement to use such land for the purpose to which it is best adapted.

LIVE STOCK ASSOCIATIONS IN RELATION TO FOREST RESERVES

A very important feature in connection with the grazing of live stock on forest reserves are the Live Stock Associations formed under the regulations of the Forestry Branch of the Interior Department. It is considered by your Commissioners that a brief outline of this system may be of benefit to groups of farmers when organizing community pastures.

Live stock associations are simply groups composed of grazing permittees within certain geographical districts, organised into associations on the basis of a model constitution furnished by the Forestry Branch. The desirability of such associations arises to some extent from the nature of the regulations, which do not provide for the issuance of long term leases but for seasonal permits, which are renewable from year to year conditional upon the observance of the regulations. These permits authorize the permittees to graze a stated number of cattle on a certain range. The permittee is not granted exclusive use of such range, other permits in many cases being granted within the same area. Under such conditions it is in the interest of the permittees to co-operate to secure economical and efficient management of their cattle, and whenever the permittees within a certain district organize themselves along the lines of the model constitution, they are given an opportunity to appoint representatives to act as an advisory board, and to confer with the local forest officer with regard to the various problems that arise. This privilege is specially provided for in section 54 of the forest reserves regulations. The association thus furnishes a satisfactory means whereby contact is established between the forest officer and the grazing permittees.

In most of the cases where such associations are formed, it has been found advisable to enclose a definite grazing area by a fence, in which case the association is granted a permit at a nominal fee, to erect a fence

satisfactory to the forest officer. The association is allowed to cut timber for the fence posts free of dues, but must supply the necessary wire and labor. A copy of the special conditions which are incorporated in such permits is appended, from which it will be seen that the fence becomes the property of the Crown upon completion, and that the department reserves the right to issue additional grazing permits to persons who may be entitled to such permits under the regulations, provided the new applicant pays a proportionate share of the cost of the fence. This provision is intended to guard against any qualified person being debarred from obtaining grazing privileges by reason of the existence of the association. To guard this point further, it is the practice to issue the grazing permits to the individuals comprising the association, and not to the association as a body.

FOLLOWING ARE THE SPECIAL CONDITIONS INCORPORATED IN GRAZING PERMITS IN FOREST RESERVES

This permit is issued subject to the following special conditions, and may be cancelled at any time for any failure to comply therewith:

1. "The fence shall be constructed and suitable gates shall be located as directed by the forest officer and shall also conform with the requirements of any provincial statutes as to fencing."

2. "The permit shall not establish any claim to the land enclosed by the fence."

3. "The permittee during his occupancy shall maintain the fence and gates in a condition satisfactory to the forest officer."

4. "The fence shall become the property of the Crown upon completion."

5. "The Department reserves the right to issue additional grazing permits within the fenced area, to persons entitled to such permits under the regulations, and provided the new applicants pay a part of the cost (less annual depreciation) of the fence in proportion to the percentage of the capacity of the range which each uses."

6. "Every holder of a permit within a forest reserve shall be held responsible for any fire which starts directly or indirectly. personally or through any servant, employee or agent of said permittee, upon any land within a forest reserve held under permit granted to the said permittee. The services of the permittee and his employees shall be given free whenever a fire starts on or threatens the land or improvement held under permit. Any neglect on the part of the permittee is sufficient cause for cancellation of permit."

7. "The permittee may cut free of dues solely for the erection of the fence.....fence posts from.....
.....
....."

8. "Such posts shall be cut under the direction of the forest officer, and in accordance with the forest reserve regulations, and the forest officer may require the permittee to declare under oath the number of posts cut, the location of the cutting and the use made of the posts."

HOMESTEADS

A glance at the latest map of the Department of the Interior showing the disposition of lands, reveals the fact that south of Saskatchewan's great "hinterland" there is little Crown land open for homestead entry. There are areas under lease for grazing, and most of these are located in the southwest and are, or should be, closed to homestead entry. Other areas of Crown lands, designated as "forest reserves" are also considered to be unsuited for grain growing. In addition to these there are small scattered parcels of Crown lands which are available for homestead entry but have either been abandoned or rejected by settlers as undesirable and unsuitable for farming.

Your Commissioners believe that the time has arrived when it is desirable that any of the Crown lands south of the Canadian National Railway from Kamsack to Lloydminster should no longer be open for settlement on the homestead plan, but should be leased for grazing. We, therefore, recommend that the Dominion Lands Act and regulations be amended accordingly.

GRAZING LANDS FOR THE USE OF COMMUNITIES
OF FARMERS

A great need of many districts in Saskatchewan which are eminently adapted for grain growing is that of grazing lands where live stock for which there is a place on the grain farm in winter, may be maintained during the summer months. In past years nearly every such district was fortunate in having access to some rougher or uncultivated land—in some cases a forest reserve—to which the "herd" was sent in summer. It was a community herd entrusted to some one employed to look after them during the summer and return them in the autumn when the crop was threshed. In the majority of districts such lands are no longer available for the community herd, and because of this many such community herds no longer exist.

Southwestern Saskatchewan was not favored for grain growing when grants of land were being selected by the Canadian Pacific Railway and other companies, consequently with the exception of the vicinity of Swift Current district where the Canadian Pacific Railway selected some land, the whole of the southwest, except Hudson Bay land, was Crown land, and all of such, except school lands, forest reserves and closed leases was available for homesteading. Settlers soon homesteaded and pre-empted all the available land suited for farming, so that today outside of grazing leases and forest reserves there is little except deeded land on which to turn stock—a circumstance which did not exist to the same extent in any other part of the province in their settlement period.

A notable exception to this is the public pasture in townships 22 and 23, ranges 13 and 14, and township 24 in ranges 12 and 13, all west of the third meridian. This public pasture has been available free to any farmer who cared to make use of it. However, it was unfenced, and it lacked the management which is now a feature of the forest reserves, circumstances which somewhat impaired its usefulness.

A very evident need of farmers in the southwest is some place to graze stock during the summer. The pasture land on the average farm is small and is soon eaten bare. Such pastures might be conserved

somewhat by sending part of the stock to a community pasture, retaining at home the work animals and milch cows, the latter being an important essential for most farms in the southwest.

Several farmers who gave evidence before the Commission indicated that they were milking cows and selling the cream to creameries at Moose Jaw, Swift Current and Maple Creek. They stated that, in the dry years especially, their milch cows had provided a very substantial part of their sustenance. Others gave as their reason for not keeping more cattle the fact that they had no summer range for them. But as dry seasons are sure to come in the future as in the past, and with the need for a sure income, it seems very desirable that this shortage of pasture should be overcome so that farmers who wish to engage in dairying may have the opportunity to do so. Indeed it seems to your Commissioners that unless range is found in more or less extensive blocks for community grazing the size of the farms in the southwest will have to be substantially larger than a half section in order to provide facilities for grazing.

The advantages of concentrating live stock on the rougher lands and those less suitable for grain growing and thereby making closer community settlement possible in the better grain growing areas suggests the desirability of finding a way whereby grain growing communities may acquire a community interest in a tract of grazing land. The advantages of having a closely settled and well organized community with good roads, schools, churches, telephones, hospitals, etc., requires no elaboration, as it can easily be seen that these conveniences and their efficiency are likely to be greater in a closely settled area than in a sparsely settled community, while the cost of maintenance would be less. Then too, grazing lands not having need for these institutions would not have to be heavily taxed for their maintenance.

Community grazing areas present a number of advantages. (1) A large area can be fenced at a smaller cost per square mile than a small area. Fencing required for six single sections would fence a whole township. (2) The range could be subdivided so that the various classes of cattle could be kept separate, the breeding stock in one pasture, the yearling heifers in another and the steers in another. (3) Bulls of good quality could thus be provided and used to better advantage than in small herds. Herd improvement under such conditions would be facilitated and an opportunity afforded of following a consistent policy of breeding, the advantages of which are not sufficiently realized. (4) Range management could be carried on better under the community system than under the individual ownership system, as the joint management would likely be more effective than the average of individual farm management. (5) Range and herd supervision could be conducted with a minimum of expense to the individual stockowner. (6) The marketing of animals from grass could be done easily under this system. When ready for market, uniform carloads of cattle could be made up, and all stock being branded, the animals could be identified easily and the proceeds distributed.

All grazing land being at present utilized it is evident that some substantial readjustment would be necessary before community pastures could be made available. There are the following possible sources from which lands for community grazing purposes might be obtained:

- (1) Crown lands in townships 22 and 23, ranges 13 and 14, and township 24, ranges 12 and 13, all west of the third meridian, used as a public pasture.
- (2) Forest reserves.

- (3) Crown lands held under lease.
- (4) Inferior lands now occupied by homesteaders.

These will be discussed in the foregoing order.

1. *Crown lands in townships 22 and 23, ranges 13 and 14, and township 24, ranges 12 and 13, all west of the third meridian, used as a public pasture.*

Portions of these townships have been used for public grazing for some time, but without any organized management such as is now a feature of a number of the forest reserves. These lands should be fenced and continued as a community pasture, provision being made for a board of management to decide questions of policy and administer details.

2. *Forest reserves.*

Permits to graze stock on forest reserves are granted to adjacent stockowners and farmers, and the reserves are apparently being grazed nearly to capacity. Provision is made in the regulations for resident farmers to acquire grazing privileges in forest reserves, and it is the opinion of your Commissioners that when any of the present permittees withdraw, application from resident farmers should be encouraged, as such a step would, we believe, help them to place their farm business on a safer and more satisfactory basis.

3. *Crown lands under lease for grazing.*

The largest acreage of land suitable for grazing is now held by farmers and ranchers under lease from the Dominion Government. Many of these leases are so small that to employ them as community pastures would merely upset existing arrangements and benefit but few, if any, more stockraisers. Interference with existing leaseholders could only be justified on the grounds of larger production or of some other benefit to the people as a whole. Such reasons for interfering with the small resident leaseholders are not apparent, but your Commissioners are disposed to favor the use of large blocks of Crown land as community pastures and to consider that such use would better serve the country than that they should continue under private control.

In July last the Better Farming Conference, by resolution, requested "that no further renewals or extensions of grazing leases be given for longer than one year until the survey has been made and the requirements of settlers on adjacent lands have been considered." It has been learned that the regulations regarding grazing lands in Manitoba, Saskatchewan, Alberta and Peace River tract of British Columbia were amended in the following respect by Order-in-Council dated November 4th, 1920.

"Should the Governor in Council at any time during the term of the lease think it to be in the public interest to withdraw any portion of the lands herein described or to cancel the lease, the Minister of the Interior may on giving the lessee three years' notice withdraw such land or cancel the lease."

A previous amendment provides as follows:

"(b) Grazing leases may also be granted on vacant Dominion Lands, irrespective of the quality of the soil, located over forty miles from

a railway on the condition that the lease may be cancelled, or any portion of the leasehold withdrawn from the operation of the lease, on giving the lessee one year's notice in writing, after the lease has been held three years and after a railway has been graded and the rails laid within forty miles of the leasehold."

The way would, therefore, seem to be open to enable communities to organize for the purpose of acquiring community pastures if they wish to do so. While three years may seem a long time to wait for the cancellation of a lease it is a short time for the leaseholder who is thus compelled to seek another location. Certainly the move to acquire grazing rights must be initiated by the communities concerned, and on them, according to the first regulation quoted, falls the onus of showing to the Federal Government that their application to cancel a lease or portion thereof "is in the public interest," which is, of course, the view which your Commissioners hold.

4. *Inferior land now occupied by farmers.*

This is referred to in the following chapter. It seems to your Commissioners that some of this class of land if of sufficient extent may some time be utilized as community pastures when it ceases to be used for grain growing. Only drastic action would suffice to bring about such a change in the near future, and your Commissioners are not disposed to recommend definite action of this nature, although they recognize the desirability of the end in view.

Considering therefore, the foregoing, and recognizing the need for combining the use of the range grass with the farm roughage for cattle raising, in order to encourage dairying and stock raising as a part of the farm activities in areas where frequent drought renders grain growing as the sole object of agriculture too hazardous, your Commissioners recommend:

- (a) That the Department of the Interior be asked when considering applications for renewals of grazing permits on Crown lands in Saskatchewan, to give preference in future to applications from resident farmers organised on a community or co-operative plan under The Agricultural Co-operative Associations Act, or on a plan similar to that now employed for the management of grazing upon forest reserves.
- (b) That the area in townships 22 and 23 in ranges 13 and 14, and township 24, ranges 12 and 13, west of the third principal meridian, heretofore known as the Public Grazing Area, be leased as a community pasture to the farmers of the surrounding districts.
- (c) That community pastures when organized be used primarily and mainly for the development of cattle raising.

THE PROBLEM OF INFERIOR SOILS AND THEIR OCCUPANTS

While the greater part of the soil of Southwestern Saskatchewan is of good quality and suitable for grain growing, it is not all of this class, and it is probable that fifteen per cent. or more of the area west of the Missouri Coteau and south of the South Saskatchewan river would

be classified as inferior. The inferiority of the poor soils is due mainly to the fact that they are of a sandy nature, and, therefore, subject to blowing and drifting and to drying out in periods of drought; although some are of the class known locally as "burnouts," and a few small areas are unproductive because of an excess of alkali or because of other conditions. Certain local areas of limited extent have been reduced almost to a desert as a result of too intensive cultivation of sandy soil. Under present farming methods this tendency will become more pronounced from year to year if such lands are kept under cultivation.

Your Commissioners believe that all of the occupied land of this region can be profitably used provided it is priced according to its productive value and used according to its suitability, but the use of the very inferior tracts will likely be along the lines of stock raising rather than grain growing. The disadvantage of sparse settlement on unprofitable lands and the advantages of using such lands for community grazing suggests the desirability of finding some means of permitting settlers to move from sandy, stony, alkaline or "burnout" lands and start elsewhere on a free homestead, as it is probable that not all of the farmers resident in the areas of inferior lands are likely to remain and change from grain growing to mixed farming, for the following reasons:

- (1) The land they occupy would not provide enough grazing to maintain the numbers of live stock necessary to support a family.
- (2) In some of the sandier districts the soil has drifted to such an extent that much of it is devoid of vegetation, a condition which would further deter the present occupants from such development.
- (3) The limited crop returns of recent years have left the most of such residents crippled financially.

A few residents of one or two localities asked the government to consider some way to move them to other districts better suited for farming, and consequently this question received some consideration by your Commissioners. As one man put it, "If we go, how can we go? If we stay, how can we stay?" Considering the last question first, we are of the opinion that some types of soil, the extreme sandy soil and the larger areas of "burnouts" cannot be used profitably for grain growing under such conditions as obtained during the past four years. To abandon such lands would be the first step towards finding a way to use them, as the valuations placed on such lands prevent putting them to a use which will make them profitable. We think, however, that a soil survey should precede the adoption of any very definite policy for any particular area. We believe the simplest way to get the least valuable lands into profitable use is to survey them, ascertain their best use and utilize them accordingly. If a soil's survey and the experience of the settlers indicate that a district is not adapted to grain growing, to abandon it would appear to be a wise decision.

The value of those tracts of land, if used for grazing purposes, will depend upon productiveness, that is the number of stock which a given unit will sustain in good condition for a given period, and these are as yet unknown factors. A certain amount of evidence was submitted by farmers and stock growers relative to this latter point, but no person could say what grass land will be worth per acre on a rental basis one year or ten years hence, as so many factors enter the calculation. The general opinion expressed to your Commissioners was that from 25 to 35 acres of prairie land which has never been plowed is required to

maintain a horse or a cow for a year. Crown lands are rented to stockmen at 4 cents per acre per annum. They are taxed about 3 cents per acre per annum or 7 cents in all, which represents an annual interest return of $3\frac{1}{2}$ per cent. on a valuation of \$2.00 per acre. These figures would indicate that so long as there are enough Crown lands to meet the demands of stockmen for grazing land, the lands of inferior quality which are the subject of this discussion will not be valued by stockmen at any higher figure.

Reverting now to the farmer's first question, "If we go, how can we go?" we would say that there are homestead lands in the northern portions of Manitoba, Saskatchewan and Alberta, most of which are more or less covered with tree growth varying from "scrub" to timber. We are of the opinion that settlers in the southwest who wish to leave their present location should be given the opportunity to transfer their present holdings back to the Crown and enter for a homestead north of the main line of the C.N.R. from Kamsack to Lloydminster under the conditions laid down by the Dominion Lands Act and regulations, and we would recommend that the Dominion Lands Act be amended so as to permit of this being done.

In this connection an effort should be made to direct such settlement to chosen areas, and to require a reasonable concentration of settlement so that railways, highways, and schools could be supplied to a maximum number of people at a minimum cost.

The use which we think should be made of inferior lands has already been indicated. We are of the opinion that whenever feasible they should be formed into community pastures under the management of committees of grazing permittees such as are organized to manage the grazing in forest reserves. The Agricultural Co-operative Associations Act already provides the means for farmers to organize stock producers' associations. Your Commissioners do not, however, see any feasible plan at present whereby the owners of the lands in question are likely to pool their holdings for use as community pastures.

Meanwhile your Commissioners recommend:

1. That a reconnaissance survey of Saskatchewan be begun as soon as possible (beginning with the southwestern districts) in order to outline the various soil areas and classify them as to their suitability for grain growing and stock raising; and that the proposed reconnaissance survey be followed by a more complete agricultural survey in order to render the investigational and research work of our Agricultural College and Experimental Farms most effective.

2. That it is desirable that those areas which are unsuitable for grain growing be converted into community pastures for summer grazing of cattle and other stock.

3. That rural municipalities be given power to prevent the cultivation of sandy lands which "blow" to such an extent as to be detrimental to adjoining farm lands.

4. That experiments be undertaken with a view to determining the varieties of grasses and the methods most suitable for rendering such areas fitted for grazing purposes.

5. That the Dominion Government be asked to have the Dominion Lands Act amended so as to permit homesteaders of lands in inferior soil areas in the prairie provinces to make entry for a homestead in a selected district after transferring back to the Government the lands which they occupy; and that a study be made of districts where homesteads are available in order to determine their character and suitability for settlement.

NOXIOUS WEEDS

A system of farming which requires a maximum of well cultivated ground and a minimum of grass land favours the growth of plants (weeds) which in a different system would find it impossible to get a foothold. In other words, grain growing favours those weeds which in "mixed" or balanced farming would be easily controlled if not exterminated in a few years.

"A weed is a plant out of place." A noxious weed is one which persists in places where it is not wanted. Prairie land is covered with plants before it is first plowed, and the first task of the farmer is to destroy *native* plants in order to prepare a place for *cultivated* plants to grow. When this has been accomplished well the result is a good seed bed in which not only seed of cultivated crops, but seed of any plant suited to the country, will germinate and take root and grow, whereas, among the prairie grasses, these seeds could not find room to establish themselves and produce seed for future generations of plants.

The weeds which cause farmers the greatest loss are commonly known as Perennial Sow Thistle, Canada Thistle, Wild Mustard, Wild Oats, Russian Thistle and Stinkweed. Some others are found in large numbers in some districts, but are more easily controlled by tillage methods than those here named. And while all these are a menace in grain growing they are not nearly so serious a problem in a system of mixed or balanced farming.

A knowledge of their habit of growth is of course essential in order to know how to destroy them most easily and cheaply.

It is not the purpose of this report to go into this question in detail, but rather to set forth certain facts relative to the noxious weed problem in Southwestern Saskatchewan and the opinions of the Commission relative thereto.

The most talked of weed in the area to which the Commission devoted its attention is the Russian Thistle. It is a tap rooted, drought resistant annual plant which has come to Canada from the adjoining States of Montana and North Dakota. In seasons of more than average rainfall (which are relatively cooler than the drier seasons) it is not a serious competitor with grain crops, which keep ahead of it if they have adequate moisture. But in hot dry seasons it is liable to rob the wheat, oats, barley or flax of its moisture to such an extent as to destroy any hope of profit.

Like most other weeds it has some feed value if handled properly and has, in fact, saved from starvation many head of cattle and horses during the years 1918 and 1919. If cut before it ripens it makes usable feed, but has a marked laxative effect upon the bowels of animals which eat it. A good way to use it would probably be to cut it green and stack immediately and tramp it hard; a horse can be used to do this. This makes "brown hay" and is practically ensilage without a silo. Like ensilage it is not a complete fodder but should be fed with straw or hay. Any grain crop which is so badly infested with Russian Thistle as to promise no profit if handled in the ordinary way, would make feed if cut green and cured as hay.

The control of Russian thistle like the control of drifting soil is a community as well as an individual responsibility. A prime essential is to keep the ripe thistles from blowing over the country. One man alone cannot do this, but timely action by every farmer will help. The penalties of the Noxious Weeds Act should be imposed upon every person who deliberately liberates ripe Russian thistle at any time and permits them to blow away. Cultivating the crop land in the spring before

seeding, or harrowing when the crop is up a few inches will help to destroy the young plants. This of course could not be done safely in soil that is liable to "blow." Those plants which survive the harrowing should be destroyed by cultivation in the early fall when the crop has been removed. Municipal officials should lead in a campaign against this weed and should pay particular attention to roads and vacant lands.

In controlling Russian thistle as well as in combatting drifting and drought, winter rye is a promising crop. When winter rye is sown in August on spring plowed land, kept free from weeds till that date the thistle cannot seriously damage the growing crop, and the early maturity of winter rye leaves time for the farmer to keep the field clean by live stock or by cultivation.

Russian thistle and many other weeds may be controlled upon cultivated fields by pasturing them to live stock, and this operation, instead of costing money as it does when horses and machinery are employed to kill weeds, actually turns in revenue and meanwhile saves other feed. Farmers who are in the dairy business find that milch cows do well when grazing on summerfallows in which Russian thistles are growing. Sheep, too, will graze on the fallow and nibble the green shoots, thus conserving moisture by keeping the plants down, and helping to provide a revenue from wool and mutton. Indeed, it requires little demonstration to show that fenced farms with what livestock they will carry need not long be polluted with noxious weeds if at the same time a sufficient variety of crops is produced which, while furnishing fodder for animals, also facilitates the destruction of noxious weeds.

The Noxious Weeds Act and its administration is a subject which calls for comment. The control of noxious weeds is one of the duties of municipal councils, both urban and rural, but it is perhaps true that no legislation is more perfunctorily administered than this Act. The average man knows what weeds are on his land, but so long as the weed inspector takes no notice of them the situation is one which causes him little or no concern. The weed inspectors are local men, and "a prophet is not without honour save in his own country." The weed inspectors too, are sometimes hampered in their work by the instructions they receive, and cannot do their most effective work because of their limited term of service.

Since noxious weeds are the product of our system of agriculture, some weeds are unavoidable with grain growing. Weeds on a man's farm are regarded as his exclusive business so long as they do not bother and are not likely to affect any other farmer. But when they do, as is frequently the case, it becomes the duty of the municipality to protect the public. Weeds on occupied land, on vacant land or on road allowances should receive early, prompt, thorough, adequate treatment from the municipal council through the weed inspectors.

To your Commissioners it seems:

1. That there will be a surplus of noxious weeds so long as grain growing is the major farm operation.
2. That no weed—not even the Russian thistle excepted, is uncontrollable if the system of farming is changed sufficiently to permit of the fight against them being carried on cheaply and in a greater variety of ways.
3. That every farmer should realize that weeds use moisture and that a shortage of moisture is the main cause of light crops.
4. That every farmer should depend upon himself to find and kill weeds and not allow them to steal his moisture before he takes action.

5. That nearly every farmer can fight weeds a little better than he has been doing.

6. Then he will do so when he realizes that his farm is his future home, and not merely the place where he is going to make enough money to retire.

7. That councils should consider the weed problem as one of their most serious responsibilities and provide for prompt, efficient and thorough work in bringing about improved conditions.

8. That road allowances should not be cultivated, and if the road-sides have been broken up they should be reseeded to grass and mowed every summer.

9. That weed infested lands which have been cropped and are abandoned should be mowed before the plants have passed the flowering stage, and not after they ripen, as is too frequently the case.

10. That weeds which ripen are better left standing than mowed to blow over the surrounding country.

A SOIL SURVEY FOR SASKATCHEWAN

Your Commissioners are of the opinion that a soil survey for Saskatchewan is desirable because:

1. *The Soils of Saskatchewan lack uniformity.*
2. *Present knowledge is inadequate.*—We are prone to blame lack of moisture, unsuitability of crop or variety for crop failure. These are assumptions and not based upon scientific fact. The soil as a factor in crop production has not been carefully studied. The analysis of soils thus far reported have been random samples and may not be representative of the regions they were intended to represent.
3. *The boundaries of our various soil types should be defined and mapped*—This is desirable because (a) cultivation of inferior land can be prevented or at least discouraged; (b) the kind of agriculture to be practised is dependant on the type of soil; (c) the type of soil determines to a large extent the kinds of crops to be grown, the proper rotation and incidentally the size of the farm.
4. *The survey would determine the proper placing of sub-stations.*—It is most desirable that our *extensive soil types* be represented in sub-station work.
5. *It constitutes the basis for future soil investigations.*
6. *It supplies very necessary information to settlers.*
7. *It supplies very necessary information to county agents or district representatives.*

THE KIND OF A SURVEY DESIRED

There are two kinds of surveys (1) the reconnaissance and (2) the detailed survey. By a reconnaissance survey is meant a rather rapid, superficial examination of the land. This kind of survey is desirable where a state is to be subdivided into areas of similar origin and topography to be followed later by detailed examination. The advantages are the cheapness and the rapidity with which the work can be done.

The detailed survey involves the careful classification and mapping of the soil. It is particularly adapted to regions of intensive systems of farming where the high cost per acre is warranted; also to less fertile but more humid regions where the application of soil amendments is practicable and profitable.

For conditions in Saskatchewan a type of survey between the two would be more practical. The province is very large in extent and the soils are badly mixed. A superficial reconnaissance survey undoubtedly would not reveal large areas similar enough in origin, topography and general character to advise similar treatment. Furthermore, agriculture will always be practised on an extensive scale. The present needs are not so much for soil amendments, as for the establishment of a type of agriculture adapted to conditions. It is, therefore, desirable that the survey be fairly rapid, fairly cheap and yet sufficiently detailed to be useful to farmer, county agent and investigator alike. All that being once done, the work would not have to be done over again.

The method of soil surveying consists of examination of the soils in the field by trained men. Two or three men work together as a party, and surface, subsurface and subsoil are examined. When in doubt samples are collected and sent in for analysis. Where uniformity exists the type is indicated on maps with colored pencils.

Information regarding agricultural conditions is collected at the same time. Such information may include historical matter, population figures, transportation facilities, water-supplies, schools, telephones, and if available meteorological data (precipitation and frost data), crops grown, including varieties and yields, livestock industry, tillage practices, land values, and problems or difficulties, in fact, any information bearing upon the area that might be useful to the farmer, the scientific investigator, prospective settlers, the county agent, and bank and credit companies.

In the laboratory, physical analysis is made of the soil to establish the class and type as a check and aid to field men. This determines inferior sandy land, land of doubtful value, inferior heavy land and land of first quality. Chemical analysis will determine lack of nitrogen and organic matter or lack of mineral plant food. Also the presence and concentration of alkali, and, wherever it exists, soil acidity (sourness).

A soil survey *is not* to be looked upon as a relief measure from which immediate results will accrue. It is not a cure-all of difficulties, and in itself is not an end, but rather a means to an end. But it *will* assist in anticipating future difficulties, in putting agriculture on a permanent basis, in guiding investigational work, besides being of value to farmers, prospective settlers, financial agencies, etc.

The Illinois Agricultural Experiment Station claims that as an average of a 25 year period in which scientific work was conducted, the average annual yield of wheat was increased 3 bushels per acre and corn 6 bushels per acre, due to scientific investigations and dissemination of the results obtained. *The Illinois State Soil Survey was the fundamental starting point.*

Your Commissioners, therefore, recommend that the Saskatchewan Government be asked to make provision for carrying on a reconnaissance survey of Saskatchewan, that the project should have the University as the central point of activity, and that this work be begun in the south west and be carried on throughout the province.

It is the opinion of your Commissioners that the cost of such a survey should be shared equally by the federal and provincial governments inasmuch as the Crown lands in Saskatchewan have been and still are administered by the federal government which receives the revenue therefrom, while the responsibilities of local government administration, including assistance to those who suffer crop failure, rest upon the rural municipalities and the provincial government.

RECOMMENDATIONS *re* EXPERIMENTAL WORK
FOR THE SOUTHWEST

Your Commissioners found that although there is a great deal of information respecting varieties of crops and methods of tillage suitable for the areas in which experimental work has been carried on, similar information is not available for Southwestern Saskatchewan, and we are of the opinion that it will be necessary to do such experimental work in the southwest in order to solve the agricultural problems of that region. By having a complete and thorough knowledge of crops, soils and farming methods, it is possible to greatly increase the farm income. The best farmers are anxious to make their farming productive, profitable and permanent. They realize that conditions of crop production vary with the climate and with the soil. The following questions illustrate some of the things that progressive farmers want to know.

1. What is the rainfall in my locality?
2. What are the prospects with regard to frost?
3. What general type of soil is found in the district where I propose to locate?
4. What crops can be profitably grown ?
5. What yields may be expected through a series of years ?
6. What variety of wheat, oats, barley, alfalfa or other crop is best for my locality ?
7. What methods of tillage can I use to best advantage ?
8. What are the best methods of surface disking, cultivation, etc. ?
9. What intertilled or row crops can I use instead of summerfallow?
10. How can I secure a stand of sweet clover, alfalfa, brome grass or other pasture or meadow grass ?
11. What are the best methods of growing these crops, whether broadcast or in rows, and if in rows, how far apart shall I sow the rows and shall they be sown as single, double or triple rows ?
12. What rate of seeding per acre shall I use for each crop?
13. When shall I sow each crop for best average results ?
14. How deep shall I sow my cereals ?
15. How deep shall I plant my potatoes ?
16. What is the best silage for my district.?
17. Shall I list, drill, check or double list my corn or sunflowers ?
18. How far apart shall I plant the rows of sunflowers in order to leave the ground in shape for a crop to follow ?
19. What rotation of crops can I follow with profit and with due regard to the effect on my soil ?
20. What can I do to keep my soil from drifting ?
21. What can I do to bring a certain alkali spot under cultivation ?
22. I understand that barn yard manure is considered the best fertilizer in the old countries, but how can I use it on the dry land on my district without drying out the crop ?
23. Can I use my surplus straw to advantage as a mulch for my winter rye or my grass fields?

24. Can I plow under any green crop to help keep the fibre in my soil without too great cost ?

25. Can I use phosphate or any other commercial plant food to advantage ?

26. If I can grow corn, alfalfa, sweet clover or sunflowers, what will I do with the crop ?

27. I have a bad mess of Russian thistles. What can I do to save myself from their ravages ?

These will furnish some idea of what the farmers' problems are and the efforts they are making to solve them and to obtain help in solving them. The solution of any one of these problems may add uncounted wealth to the province and may mean the difference between success and failure to thousands of citizens and their families.

PRESENT SOURCES OF INFORMATION

Among the sources of Agricultural information are:

1. The College of Agriculture at the University at Saskatoon.
2. The Dominion Experimental Farms at Scott, Rosthern, Indian Head and Lethbridge.
3. Experiment farms in Montana and the Dakotas.
4. The weather reporting service of the Dominion Government.
5. The crop reporting service of the Provincial Department of Agriculture.
6. Experiences of practical farmers as learned through visits, letters and the farm press.

These sources are good, so far as they go, but they leave something to be desired. The principal thing needed may be summed up in the words MORE LOCAL KNOWLEDGE. In another paragraph stress is laid on the desirability of having an adequate weather reporting service to gather information on frost and rainfall in the several localities throughout the province. Another section of this report relates to the establishment of a reconnaissance or general soil survey which will map out the various general soil areas and define their suitability or unsuitability for the various types of farming. Two additional lines of work will aid materially in securing the information needed. These may be designated as substations of the College of Agriculture, and co-operative experiments with farmers.

SUBSTATIONS OF THE COLLEGE OF AGRICULTURE

Beginning in the southwest area, substations should be established from time to time as investigations warrant until a system for Saskatchewan is fairly complete. These substations would be laid out into a series of experiments designed to answer the most vital questions in the district where located. They should be located with due reference to climatic and soil conditions, and at convenient centres so that they would be accessible, and they should be of sufficient size to permit of a system of balanced farming being carried on in addition to the series of field husbandry experiments which would be their primary object.

CO-OPERATIVE EXPERIMENTS WITH FARMERS

After certain varieties have proved to be best or certain practices have been found to give satisfactory results in a given area, the question often comes up, "Can the practical farmer get good results with the variety or can he put the method into practice to advantage on his own farm?"

Then, too, there are certain local conditions that require attention. For example, there are alkali spots that can be corrected and others that cannot. There may be land that tends to be sour or acid. There is rough hill land, suitable for grazing only, where it would be desirable to have a better growth of grass. This type of work can be done to best advantage by means of co-operative experiments with individual farmers.

In this connection it is recommended that some assistance be given by the Provincial Government in supplying grass seed for co-operative experiments. Such experiments would be useful object lessons and, if successful, would also give the experimenter an opportunity to grow the seed necessary to increase his acreage of grass land.

It may even be possible to co-operate with a few in working out a complete crop rotation system and a system of crop utilization, by means of pit silos or upright silos and livestock.

The agricultural representatives or county agents may be very helpful in carrying out such co-operative experiments or demonstrations. This type of work is of an experimental nature, but the experiments often prove to be very helpful demonstrations. Indeed, there is no distinct line of cleavage between experiments and demonstrations in agricultural work.

Your Commissioners therefore recommend:

1. That one or more substations of the College of Agriculture be organized in the southwest in order to acquire definite information relative to agricultural methods best adapted to that region.
2. That co-operative experiments with farmers be undertaken to test varieties of crops and methods of production in local areas.

CROPS FOR SOUTHWESTERN SASKATCHEWAN

Judging by the experience of settlers in this territory as well as by the experience of farmers and the reports of experiment stations in areas having similar conditions elsewhere, your Commissioners believe that the following crops may prove of value in the southwest area: winter rye, spring rye, durum wheat, corn, sunflowers, potatoes, millet, oats, barley, alfalfa, sweet clover, brome grass and slender wheat grass (western rye grass). Furthermore, there are varieties of each of the above mentioned crops that have possibilities of proving much superior to those commonly grown.

Winter Rye.—This crop is of value because of its hardiness, early maturity and adaptability to various uses. It may be sown in the fall and used for early summer pasture or grain or both. In case of injury from hot blighting winds it may be cut for hay. Or it may be sown in the spring or early summer either with or without oats and used for later summer pastures, with a possibility of producing hay or grain the next season. It can be grown on either light or heavy land and is

capable of utilizing to the utmost the available plant food and moisture. It helps to keep the ground covered and is a big help in areas that drift.

In seasons of light rainfall close grazing of winter rye would reduce the yield of hay or grain to some extent.

Fall rye has for a number of years been somewhat popular in Piapot and Maple Creek districts, where the need for a supply of fodder for winter feeding of live stock was urgent. Its use is being extended as it has been found very effective in combatting soil drifting in May; being an early maturing crop is much less liable than wheat to be seriously injured by July and August droughts; and it promises in addition to be valuable in combatting Russian thistle as well as other weeds which flourish with spring grown grains.

Spring Rye.—While not as useful as winter rye because it does not cover the ground in winter and early spring, this hardy grain has a place in our agriculture. It is not as subject to disease as wheat and will do better on poor soil than wheat.

Durum Wheat.—This type of wheat has a very long beard and thus protects its blossom from the hot sun or wind to a surprising degree. It was brought into the United States from Russia (where it has been grown for ages in a semi-arid climate) for the purpose of finding a wheat more suitable for Western Dakota and Eastern Montana. There it has succeeded well, often yielding more than double the yield of common or bread wheat and averaging about a third more bushels per acre through a ten year period. The leading variety is Kubanka, which is being tried in a few localities in Saskatchewan with somewhat encouraging results as to yield, although the domestic market alone is still unprepared to absorb a large production of this crop. Until it has proven superior by local tests, farmers will likely sow Marquis or Red Fife, the latter being considered by some farmers to be preferable to Marquis in dry years on account of its producing a longer straw.

Oats and Barley.—Oats have failed in the southwest more often than wheat but it is doubtful if they have received as favorable a chance as wheat, which usually has had a monopoly of the best prepared land. Ordinary late maturing oats may not do well in the southwest. The same may be true of the taller types of barley. But there are certain varieties of oats such as the Sixty Day and barley such as Gatami, White Smyrna and Odessa that deserve a trial in that region. Then too, results of South Dakota experiments, show that oats and barley need not always be grown as solid or broadcast crops. They do well when planted in three row groups three feet apart. Oats and barley may have greater possibilities in the southwest than experience to date indicates, if more suitable varieties and methods are introduced.

Flax.—Flax has frequently been grown as a catch crop on breaking the same season, and every year some flax is sown in this region, although the acreage has been small since war prices have made wheat growing specially attractive.

Corn.—According to Indian legends, the Great Spirit gave corn to the Indians to keep them from starving. It has not failed to produce fodder in eight seasons at Saskatoon. Field Husbandry investigations in the southwest districts during the past two years have proven very encouraging. Early maturing varieties of corn have been grown to maturity in the Maple Creek district for a great many years, and for ensilage this crop has been successfully grown over a considerably wider area.

Sunflowers.—Sunflowers came to us from Russia, but only very recently have they been considered valuable as a silage crop. The Montana station secured such good results that the practice of growing them for silage is becoming common. They have been grown for nine

years at Saskatoon, and during the past three years have been used for filling the silo. Sunflowers resist frost better than corn and produce a greater amount per acre. Just what effect they have on the following crop of grain is not fully determined by experiments as yet.

Millet.—Millet is a quick growing hay crop. It can be grown like wheat in close drills or may be sown in double rows three feet apart and intertilled. It is neither drought resistant nor frost resistant, but frequently dodges both because of its rapid development. One type of millet, the proso, is especially valuable to the dry land farmer, because its grain supplies him with a good poultry food and its straw makes good forage or in case it is caught by frost or drought it still makes good roughage.

Alfalfa.—The "good fodder" of the Arabians, may have a place in the southwest. Small plots have been grown by a good many farmers, and some very successful crops were harvested during the past ten years. The extreme dry seasons, however, result in low yields of this crop, but such seasons favor those engaged in the growing of alfalfa for seed. There are hardy varieties such as Grimm and there are methods of sowing such as single, double and triple rows that may prove a success if tried. Another difficulty could be overcome if the best time and method of seeding were known.

Past experience in Saskatchewan has indicated that on other than drifting soils the best method is to sow clovers and grasses early in June without a nurse crop. In Dakota, early sowing in late April or early May with a nurse crop of flax or early maturing oats gave good results and might prove advantageous here, especially on land liable to blow a little. In any event this method is worthy of a trial. The shelter crop should be gotten rid of when the alfalfa seems strong enough to get along alone.

Sweet Clover.—"Alfalfa's Cousin," is a real friend of the dry land farmer. Like alfalfa, it is a great soil improver. But it is a better seed producer, a better rotation crop and a better pasture crop than alfalfa. Seeding a few pounds of sweet clover per acre on summerfallow or corn ground with a light seeding of wheat, should be given a thorough trial. Your Commissioners found a few who are already giving it a trial. Until seed can be obtained more cheaply farmers may prefer to sow sweet clover alone in rows about 42 inches apart.

Brome Grass.—The great dry land grass of Russia is a perfect soil binder, is green first in spring and last in the fall. It has a running root system that enables a thin stand to thicken. In mixtures with alfalfa, sweet clover, etc., it makes a desirable meadow or pasture. What was said about seeding alfalfa will apply equally well to brome.

Slender Wheat Grass.—This grass which goes in so many localities under the nickname of "western rye" is a bunch grass. It has no creeping root stalks. For that reason, a thin stand cannot thicken from the roots. It is a very nutritious forage but does not make as tough a sod for grazing as the brome, nor is it as good a binder. On the other hand, it is a very desirable hay or meadow grass.

Potatoes.—"Spuds" are a great help in reducing the outlay for a living. Each farm may well grow its own supply. It is usually not a good plan to try to grow many potatoes at a long distance from market. As a dry land garden crop, the potato is very desirable. It must be well cultivated and this helps the next crop.

Possibilities for the Future.—As suggested in the preceding paragraphs, there are many drought resistant varieties of forage plants and cereals that have never been given a comprehensive trial in the southwestern districts. Much of the hope for the future lies in such plants,

coupled with methods of production adapted to conditions. In this brief report your Commission has merely tried to suggest, without attempting to explain in minute detail. (Further information relative to crops, crop production and soils may be had from the Field Husbandry Department of the University Agricultural College at Saskatoon.)

A SYSTEM OF FARM MANAGEMENT FOR THE SOUTHWEST

Recommendations of the Commission, with the exception of this one, are related to the near future rather than the immediate present. Most of them, in fact, suggest policies or experimental activities to be undertaken by the University, the Provincial Government or the Federal Government for the improvement of agriculture in the southwest. This one recommends some things for farmers to do as soon as they can. When more experimental work is done locally the results will indicate whether any improvement can be made in the proposed system. But in the meantime it is submitted by your Commission as the safest and best plan for farmers in Southwestern Saskatchewan to follow.

From evidence accumulated at its hearings and from a study of conditions in regions having somewhat similar climatic disadvantages elsewhere your Commission concludes that a system of farm management in the southwest to be reasonably certain of success should be of a diversified character. The more the risk is divided the less heavily the losses will fall in any one season.

There must also be live stock of some kind to consume farm products, such as straw, corn, fodder, sunflowers, alfalfa, sweet clover, millet, low grade grain, which are of a nature unsuited to direct marketing, and to employ home labor the year round. This live stock must be an important and constant part of the farm and not merely a sideline.

There must be grazing land or access to grazing land in order to take care of the stock during a part of the summer.

There must be fodder and feed crops.

There must be summerfallow or fallow substitutes.

There should be a reserve of fodder and seed from year to year.

There should be among the grain crops a cash crop and preferably an autumn sown crop as well as spring sown ones.

There should be produced every year as much as possible of the family's needs so as to reduce the outlay for supplies.

Livestock.—The kinds of livestock to be kept on the dry farm will naturally vary. *Without question poultry and cows should be included.* A few good milch cows add greatly to a farmer's independence when crops are poor, and should be a prominent and permanent feature of every farm in districts where crops are uncertain. A small flock of good poultry should be on every farm. Sheep are of great value in keeping fields clean and consuming weeds and other forage that might otherwise go to waste in the fall. But sheep require expensive fences and some special knowledge. By starting with a very few sheep many farmers can acquire the necessary experience and the needed fences gradually. One sow and her litter is worth while, but it is doubtful whether any effort should be made by the average farmer to keep more than one unless he is sure to have enough pasture and cheap feed to give them their growth; and barley and other grain feed to finish them in the fall, which in some seasons will be difficult to produce. One litter of pigs pastured during the summer in rape, rye or oats, and during the fall in fodder corn fields or paddocks will be of great value in providing supplies of cheap meat for the family, and a surplus for sale in the usual way.

So far as surplus livestock is concerned the difficulty most frequently cited was that of not having a stable market. There is not so much demand for a high price as for a stable price, one that can be depended upon, so that some basis for estimating possible returns can be found. A satisfactory market, however, can only be had when production is regular and supplies of stock for market are free from extremes of fluctuation. A farm cannot be profitably managed by cropping a big acreage for two or three years and cutting down operations to a tenth of capacity for the next two or three years. Neither can an abattoir provide a constant and satisfactory market if the "in and out" method of raising live stock is followed. Markets for dairy products and eggs appear to have been more satisfactory, running fairly uniform and evoking very little if any dissatisfaction.

Grazing Lands.—Where there is live stock there must be pasture. In another paragraph suggestions are made for community pastures to assist the farmer on the half section farm to provide grazing facilities for his stock during the busiest part of the season at least. There are two other ways of providing pasturage. One of these consists in leasing land from absentee owners. This practice is very commonly in vogue in Western Dakota. The other is to use a part of the deeded land for pasture. If there happens to be a portion of rough land or light land unsuitable for farming this may be left in native grass. If the land is all arable and too great a proportion has already been broken up, provision for tame pastures of some kind is necessary. It is a difficult matter to secure stands of grass and requires at least a year and usually longer than that to establish stands of tame grasses. While waiting for the tame grasses to become established, provision for annual or temporary pastures can be made by seeding winter rye, hulless barley, oats, millet, etc.

Pasture Crops.—Winter rye, sown in the spring, remains in a grassy state for some time and stays green throughout the greater part of the season. If it is sown immediately after the hot weather in midsummer, it makes a good growth in the fall and can be pastured lightly during the fall, and the following spring it gives very early and abundant pasturage. Oats, hulless barley and rape can be sown alone to provide summer pasture or may be sown in mixtures with encouraging results. For example, oats or hulless barley and winter rye, sown at the rate of about half a bushel of the barley or oats to three pecks of winter rye make what is sometimes called a "two story" crop. That is, the winter rye makes a grassy undergrowth during early summer while the oats or hulless barley make a taller growth. A few pounds of rape sown in rows and cultivated will make a good growth of pasturage. On light lands where there is danger of drifting soil it will be a good plan to seed a little rye mixed with the rape in rows to help hold the soil until the rape gets a start. In cases where the stand of winter rye is rather thin in the spring, rape or oats may be sown to improve the stand.

Permanent Pastures.—For permanent pastures, it is usually best to sow mixtures. One need not seed down more than a few acres at a time. A border around the fields and any inaccessible corners may be sown first. Mixtures of brome grass and sweet clover or brome grass and alfalfa or all three combined are most desirable. Six pounds of brome grass and four pounds of alfalfa or sweet clover or both combined is sufficient seed if care is taken in sowing it. *Owing to the cost of the seed your Commissioners would suggest sowing but five or ten acres per year, gradually increasing the acreage and depending on crops for temporary pasture, as suggested above, in the meanwhile.*

Failure to secure stands will inevitably occur some seasons, but much can be done to insure stands by seeding early in the spring with a very light nurse crop of early maturing oats or barley or rye to be cut for

hay or grain as circumstances and rainfall conditions warrant; and the land seeded should always be prepared by cultivation the year preceding, so as to store moisture and make a good seed bed.

If failure results some seasons in spite of this treatment the loss will not be heavy, but we cannot too strongly urge that it is useless to seed grasses in this area by haphazard methods and that there is need of further investigations to find out just what are the best methods of securing stands of grass. The crops mentioned can also be put up for hay when needed for that purpose.

Fallow or Fallow Substitutes and Fodder or Feed Crops.—It is clear to your Commissioners that the summerfallow has been the means by which successful grain growing has been carried on in Eastern Saskatchewan where the rainfall is somewhat greater than in Southwestern Saskatchewan. And if with greater precipitation such care is needed to conserve moisture, at least as great care must be taken in regions of lesser rainfall. More crop failure, we believe, has come from poor and inadequate cultivation in the southwest than from drifting due to over cultivation, for which the land which drifts as well as the method of tillage must be held responsible. Even if a better system of rotation is found, it will still be of the utmost importance to practice good tillage.

In districts of limited rainfall a suitable reservoir in the form of a good seed bed, is an essential, and this must never be overlooked. Ordinarily the only safe plan is to farm for a dry year and hope for a wet one, and in this plan the old style of summerfallow or an approved substitute is indispensable. Indeed, an increasingly large number of men are concluding that they cannot afford to sow grain except upon summerfallowed land.

In years of average or more than average rainfall, substitutes for the summerfallow may be successfully employed, thus permitting some fodder or feed crops to be grown at the same time as weeds are being destroyed and moisture stored.

Fodder or Feed Crops.—Among the crops which may be grown on the "summerfallow" are corn, sunflowers, oats or millet, etc., in triple rows, each three row group 36 inches from the next. The crops may be either harvested or pastured as occasion warrants. Experiments at Saskatoon show that wheat after corn yields practically the same as on fallow. The effect of other intertilled crops upon the subsequent wheat crop is not so well known. Land which is liable to blow may be prepared for a grain crop by sowing strips of it to intertilled crops, "fallow substitutes," and leaving between these the strips of bare fallow which might be sown to winter rye if desired.

Grain Crops.—The cultivated land described in the last paragraph may be sown to a diversity of grain crops rather than to wheat alone, although wheat is likely to be favored as a cash crop. Winter rye, spring rye, oats, barley, etc., are available and may be grown to advantage. No one farmer may care to grow all of the different kinds suggested, but every farmer should have feed crops as well as a cash crop, and those who grow winter rye with some of the other kinds is more certain of returns than the man who grows only spring sown grain. This is due to the varying seasonal conditions. In some seasons the rainfall comes just when the crop needs it; in others it is so deficient in July and early August as to make wheat and spring sown cereals practically a failure, while winter rye may get enough rain in June to insure a good yield, as it will usually ripen before the hot July winds can affect it seriously. Such conditions favors grasses and other hay crops. In such a season there may be fair rains in September or late August—good for corn, sunflowers, potatoes and late maturing crops.

The Silo and Root Cellar.—Many of the crops that can be produced to best advantage on the dry farm are not marketable in a direct manner. It is necessary to convert them into some form of livestock product. This is true of corn fodder, sunflower stalks, mangel beets, immature grain, Russian thistles, millet hay and many other products of similar nature. Some years, forage is produced in abundance. Again, there is a shortage for a season or two. The only safeguard against such lean periods, "the seven years of famine" of the Bible, is to store feed during "the seven years of plenty." This can be done by carefully stacking straw, hay and dry corn fodder and by providing silos for the green forage and root cellars for the roots. These silos and cellars need not involve a large outlay of cash. Pit silos crudely constructed and properly covered root cellars which are little more than dugouts will serve the purpose. A pit silo bulletin has been prepared by the field husbandry department of the university, which may be had on application, free of charge. This bulletin describes and illustrates methods of preparing and using the pit silo.

The Garden.—The garden on the dry farm should not be neglected. It improves the farm living and besides saving money saves the health of the family. The succulence, the mineral matter contained in vegetables, and the variation in the diet afforded all aid in maintaining health, which is the main asset of any family. If a well can be provided with an elevated tank for irrigation purposes it will practically insure success. A wide variety of vegetables can be produced, including carrots, beets, potatoes, cabbage, onions, radishes, lettuce and many others. Besides vegetables there are many hardy small fruits, strawberries, raspberries, plums, sand cherries, etc., that can be grown. An excellent bulletin treating this subject in detail has been prepared by the Provincial Department of Agriculture which may be had free upon request. Too much emphasis can hardly be laid upon the desirability of having a good garden.

The Farm Ice House.—Comfort is one of the things for which all are striving. One of the important additions to home comfort is provided when we have an ice house or an iced cellar. Ice can be put up during winter by artificial methods if there is no natural ice of good quality in the vicinity. Farmers who have wells can provide a very useful way of keeping perishable products cool in summer, by having a covered underground reservoir or cistern in which to freeze water during the winter. If a large enough "pit" is made it will be useful throughout the season. A shaded location is best.

Water can also be frozen in pasteboard cartons made especially for the purpose, or it may be frozen in a tank and cut up into convenient sized pieces. If care is taken to save the chaffy part of the straw pile which accumulates near the tail of the threshing machine, this material will serve very well to use in packing the ice. The ice is laid in the shed or cellar in layers well packed with chaff on all sides.

The ice thus saved will serve many useful purposes the following summer. It will provide for cool drinking water and for the better preservation of butter, fresh meats, cream, milk, etc. All of these things aid in making the farm homelike and comfortable.

Wind Breaks.—Every man's ambition to plant a few trees and properly care for them by cultivation, if carried out, will eventually improve the chance of crop production by breaking the surface wind sweep and will create a beautiful landscape out of the bald, bare prairie. Where trees already exist they should be husbanded carefully. A grove of trees is worth a great deal to any farm. Our forefathers, in

developing the wilderness, strove to make homelike homes. The settlement of North America is strong evidence that their policy was right. Let us follow their example.

The System as a Whole.—The foregoing may be briefly summed up as a suggestion for conducting a diversified farm on a rather small scale, providing for pasture and meadow facilities, keeping a limited amount of livestock to consume products otherwise unsaleable, such as forage, straw, drouth stricken or rusted sheaf grain, and providing for a limited amount of cash or market grain crops. The fundamental principle underlying the whole system is division of risk, provision for a large part of the food supplies on the farm itself, thus insuring a degree of independence and freedom from debt not possible either in straight grain farming or stock ranching. As some of the districts in the southwest may be close to "the limit of profitable cultivation," the needs of the farmer and his family should as far as possible be produced on the farm.

The size of farm best suited to the operation of such a system has not been determined. The half section is the prevailing size at present. Unless there is grazing land available, a half section (unless real good land), will be too little for the average man. Perhaps a section of good land would be nearer right. The size of farm will vary with the climate and the soil. The drier the district or the rougher or poorer the soil the larger the farm or ranch must be, and the greater the proportion of it which should be kept under grass. Also the drier the district the greater the dependence which must be placed upon the summerfallow or acceptable substitutes for the growing of crops. The experience which one has and his observation of his neighbors and their methods will suggest many things to a studious and observant farmer, and one should not overlook any such means of securing information in this regard. To recommend a larger area than a half section would not be wise, as the average man has no opportunity to acquire additional land at present, and if he could acquire it would probably be worse off with than without it until he has made the best and fullest use of the land of which he is already in possession. The recommendation of your Commissioners to the average farmer who reads this report is, therefore, to begin as soon as possible and with the least capital indebtedness possible to work into the system of farming outlined in this chapter. It is not expected, and he must not expect, that it will make him rich quickly. It will be a slower process than would follow a succession of years like 1915 and 1916, but it will be safer and surer, and will bring less worry and we believe less hardship, and more comfort and satisfaction than a system of grain farming alone.

THE MANAGEMENT OF DRIFTING SOILS

The special Commission appointed to study the problems raised by soil drifting were impressed by their importance and the need for an understanding by farmers of the causes of soil drifting and of possible control measures. As this question has been dealt with in a concise and comprehensive manner in Professor Bracken's book, "Dry Farming in Western Canada," your Commissioners deem it desirable to include in this report the greater part of the chapter on soil drifting, and do so with the consent of the publishers: The Grain Growers' Guide.

"Soil drifting is one of the most serious problems facing the farmer on some types of soil in the open plains region of the west. It is the

first and most emphatic evidence of either poor soil, unsuitable tillage or soil deterioration. During the recent years it has been responsible for the partial or complete destruction of thousands of acres of crop in many different portions of the plains area, and is a problem in all three prairie provinces as well as in Dakota, Kansas, Nebraska and other states. In fact, in prairie regions having an annual average precipitation below twenty inches, it becomes more or less prevalent when continuous grain growing is practised with no return of organic matter to the land.

The damage caused by soil drifting is evidenced not only in injury to the crop that may be on the land but also to the soil itself. The soil is injured by the removal of much of the surface or more productive part. Aside from these effects of soil drifting there are other objectionable features such as the possible serious injury to adjoining crops or fields, the spread of weeds and the interference with traffic as a result of the accumulation of drifting soil in road allowance.

The chief factors favoring soil drifting are a fine textured soil, low precipitation and frequent high winds in early summer before the land is protected by the growing crop. When to these are added too much or unsuitable surface tillage, and a system of farming which is wasteful of soil humus and returns little or no organic matter to the soil, we have a combination of conditions that is responsible, not only for the large losses from soil drifting that have already occurred, but also for preparing the way for still more serious losses in the future if some radical changes are not made in the methods of tillage and cropping heretofore practised in the affected areas. The greatest damage from this cause is to be observed in the western and southern portions of the province.

The chief causes of soil drifting are the high wind velocity and the low cohesion or binding force of the exposed soil particles. The wind velocity as well as the frequency of high winds and their general direction are climatic conditions which cannot be controlled; hence man's only recourse is: (1) to increase the resisting power of the soil and (2) to reduce the exposure of the surface soil by some form of protection. The means employed to prevent excessive damage from soil blowing therefore fall into two groups: (1) those that increase the resisting power of the soil, and (2) those that protect the soil surface from the wind.

Among the methods used to increase the power of the soil to resist the wind are: (a) increasing the moisture content, (b) increasing the organic matter content, and (c) modifying the structure of the soil. The protection of the soil surface from the wind may be accomplished by: (a) growing a protecting crop, (b) letting the stubble of one crop remain until shortly before the time of seeding the next crop, or, as with corn stubble, through the whole of the next crop season, (c) applying manure or straw to the field, and (d) providing artificial protection such as the growing of wind breaks. We shall discuss in detail only the more important of these practices.

Increasing the Moisture Content.—When a soil is moist its particles are not as likely to become separated and blow away as when the soil is dry. This fact is of value chiefly to the farmer on irrigated land where water may be applied at will. Under dry land conditions it becomes of value only in so far as one may by keeping the surface soil firm, also keep it moist to within a very short distance of the surface. The chief value of packing, in the control of soil drifting, is to be found in the fact that it aids in bringing moisture from below to the surface soil, thus increasing the resistance of the particles to the wind. On the other hand if there is not a fair supply of moisture in the lower soil, the breaking up and levelling of the coarse surface particles by the

packer will tend to encourage soil blowing. For this reason packing is not a desirable practice in the control of soil drifting on all types of soil.

Increasing the Organic Matter Content.—This is the chief and probably the most permanent means of lessening the danger of soil drifting. The organic matter (root fibre or plant remains) may be increased: (1) by growing perennial or biennial hay crops, (2) by applying farm-yard manure, or (3) by plowing under green crops. The choice rests between (a) growing grass crops, which in some parts are not considered profitable, or (b) going into stock or mixed farming and hauling manure to the land, or (c) plowing under green crops which has never been shown to be profitable under semi-arid conditions, or (d) doing all of these things.

The use of hay crops for the purpose of adding humus or root fibre to the soil results in: (1) improving the soil as a result of their dense root systems, and (2) providing forage for stock from which manure for further improving the soil may be obtained. The low yields of hay from perennial grasses under semi-arid conditions is well known, nevertheless the use of such hay and pasture crops furnishes what is probably the best means of maintaining the organic matter of much of our lighter soils. Brome grass, owing to its very dense root system, is probably the best for this purpose. Sweet clover promises much, not only as a forage crop but also as a soil improver. It has one advantage over brome grass in that it is a legume. It therefore leaves the soil richer in nitrogen than does brome grass, but the latter probably leaves more root fibre.

The chief value of manure is not in its content of plant food; the organic matter which it contains increases the power of the soil to hold moisture and to resist blowing. On drifting soils the only argument against the use of manure when intelligently applied is the cost of applying it. The application of manure as a surface dressing on the more exposed portions that are likely to blow first is a preventive measure that should come into general practice.

The plowing under of weeds in the fallow year, or the early spring growth of sweet clover or of the perennial grasses, is probably the only green manuring it will be found profitable to practice in our dry areas at the present time. The growing of green crops through a whole season in order to have a large growth to plow under to increase the organic matter content of the soil will not likely ever come into general use in the West, for the reason that the organic matter thus added to the soil is secured at the expense of an enormous quantity of soil moisture which is itself generally the limiting factor in crop yields. On soils that are low in organic matter in areas of light rainfall, it is questionable how far this practice may be carried before its waste of soil moisture will result in making the remedy more to be feared than the disease.

Modifying the Structure of the Soil.—Soil drifting occurs chiefly on the fine textured soils—the sandy types and the heavy clays that slake down to a fine powdery condition on top. The fallow generally suffers the most, although fall plowed land is not free from erosion and spring plowed land on some soil types occasionally blows. The smaller the soil particles are and the drier they are the greater the probability of their blowing away. The problem is therefore one of preventing the soil becoming too fine and too dry on top. The drying out of the top layer cannot be prevented, but the formation of a fine “dust” mulch may be avoided, at least on most soils. The use of the unfortunate term “dust mulch” in so much of the Western Canadian and American agricultural literature, is responsible for at least a portion of the excessive drifting that has occurred in recent years. The “dust mulch”

has no place in the agriculture of any dry country where high winds prevail. A rough cloddy surface developed by deep cultivation and preferably left in small ridges by a cultivator is to be preferred. In the heavy clays of the Regina district, it has been found that the use of the narrow toothed cultivator on the fallow just before seeding produces good results by bringing up damp soil which dries in a lumpy condition and usually remains in that state until the crop affords some surface protection. The hoe drill has the same effect and at the same time performs the operation of seeding.

On drifting soils the cultivator should take the place of the disc and harrows on the fallow field. Once harrowing after the plow, in order to level the surface, is all the harrowing such a fallow needs if the soil is prevented from baking or cracking and the weeds prevented from growing by the use of the cultivator. More care in plowing in order to secure a level surface, and the use of the packer (preferably the sub-surface type) behind the plow, are practices that are making harrowing less necessary and are proving to be more efficacious in lessening soil drifting. A ridged surface such as is left by the cultivator provides a refuge for the fine particles in the bottom of the narrow ridges, and in practice is found to result in less blowing and in the production of greater returns than a smooth surface. Working the soil when it is dry should be discouraged. When it is slightly moist below the surface a more granular or lumpy top can be developed than if tilled when dry.

The use of the press drill leaves the soil in better condition to withstand the effects of the wind than the use of most other types. The single disc is particularly undesirable on soils that drift.

Shallow soils or those having a deficiency of organic matter in the subsoil should not be plowed deep, or they will soon begin to blow. The surface layer of such soils is richer in organic matter and therefore much more resistant to the wind than the lower layers when the latter are turned up on top. This does not apply to deep soils nor to those having a subsoil which is not likely to blow.

Growing Protecting Crops.—The most serious drifting occurs in May before the spring sown crops cover the ground; but winter drifting is not uncommon in years of light snowfall following a dry autumn season. In those areas where drifting is quite common the only fields that can be depended upon to wholly resist the wind action, under severe conditions, are those that are protected by a crop or by unplowed stubble.

Perennials as Protecting Crops.—The best protecting crops, although often the least profitable, are the perennials. Among these the grasses are to be preferred, although alfalfa and sweet clover (a biennial) are equally as good soil protectors. It is very seldom that crops sown on land broken up out of sod suffer from soil drifting. In 1919 such land produced almost an average yield at Saskatoon, while many crops on fallow and fall and spring plowing were partial or complete failures.

Winter Rye Lessens Drifting.—Another commonly grown crop but one less sure of furnishing the protection needed is winter rye. This crop, like the perennials mentioned, may be sown in or following the rainy season when the soil seldom blows, and by covering the ground in May is, like the others, likely to lessen or entirely prevent any blowing. The question of growing winter rye is one that deserves consideration by all farmers living in soil drifting areas. Where drifting interferes with wheat raising to such an extent as to make it unprofitable, winter rye, in many cases, may be substituted to advantage. As a commercial

crop, however, rye generally sells for twenty-five to thirty per cent. less than wheat, so that where the latter can be satisfactorily grown rye cannot compete with it as a profitable crop.

Late Sown Oats for Soil Protection.—Where the conditions are not so serious as to require the use of one or more of these crops but where some protection of the soil is desirable, a very thin seeding of oats or other cereal may be sown on the fallow in late July or early August and lightly pastured if necessary. These plants, of course, die in winter, but the roots and leaves remaining furnish considerable protection against the high winds the following May. An objection to this practice is to be found in places where biennial weeds are prevalent. If these start after the cover crop is sown in July they will, of course, be present in the crop the next year, as no opportunity to kill them in the fall offers itself, the ground being occupied by the cover crop which would be destroyed if cultivated. A volunteer growth of grain or annual weeds in late summer has a similar effect to the sowing of a thin crop of oats, but is subject to the same objections, viz., the possible presence of biennial weeds which will live over and appear in the next crop.

Stubble as a Soil Protector.—Where soil drifting occurs on fall plowed land in winter or in spring two alternatives present themselves, spring plowing or “stubbling in.” In much of the very dry portions of the plains region, even aside from the question of soil drifting, spring plowing is rather to be preferred to fall plowing. Where these conditions obtain, of course, all the advantages are with the spring plowing because such land is protected in winter and generally blows less than fall plowing even in the spring. “Stubbling in” is only advisable on land that is free from weeds and grass and is in good physical condition. In the dry parts and on new land it is more frequently followed than elsewhere. Such fields, of course, benefit as a result of protection in the early summer as well as in the preceding winter.

Corn Stubble Lessens Drifting.—On warm soils in the southern part of all three provinces corn may be used as a partial substitute for the fallow. Where fallow land in such areas drifts badly, the use of corn as a substitute for fallowing lessens the tendency to drift. Under severe conditions the corn ground will blow, but frequently the corn stubble furnishes sufficient protection to wholly prevent serious injury from this cause. Where corn is grown and the field kept free from weeds, plowing is, as a rule, not necessary or even advisable for the next crop. Discing the corn stubble generally gives better returns. This practice results in leaving the corn stubble on the surface of the soil where they form a considerable protection against soil drifting.

Artificial Protection.—The value of windbreaks such as clumps of trees, hedges, fences, etc., is in direct proportion to their height and extent. Depending upon the severity of the storm the land adjoining such windbreaks is generally protected from ten to twenty times the height of the windbreak, although instances have been reported where such protection is felt over a much greater distance. As a means of lessening soil drifting windbreaks are practicable only for small areas. No doubt when shelter of this kind becomes established on all farms the wind velocity will be lessened somewhat, but the cost of planting and maintaining will probably be found to be too great to warrant planting out enough trees to make any appreciable effect on the wind velocity on large farms in the open plains. Where windbreaks such as hedges or fences are used to protect the farmstead or the garden, an outer row, a few rods from an inner one, should be provided in order to form a “trap”

for the drifting soil, otherwise the drift will accumulate within the enclosure and become a nuisance in the carrying out of the necessary farm operations.

Miscellaneous Practices and Suggestions.—In fields where the soil has begun to blow much can be done to check it by going into the field and plowing narrow strips of four to six furrows from five to twenty-five rods apart, at right angles to the direction of the winds. These raised portions act as checks behind which the drifting particles lodge. This is an extreme measure and is advisable where a small patch of drifting soil promises to do serious injury to adjoining areas that are not likely to blow if the drifting material can be kept away from them.

Arranging the areas to be seeded in long strips rather than approaching the square will also counteract the injurious effects of the soil drifting to a certain extent.

By sowing the grain deeper than usual, thus leaving the soil furrowed, tends to prevent soil drifting and lessens the probability of the seed or the plant roots becoming exposed.

The sandy soils take more permanent injury from drifting and are much less subject to favorable modification by tillage than the clay types; the maintenance or increase of the organic matter content by applying manure and growing grass or legume crops becomes therefore of much greater importance with these than with heavier soils.

The introduction of perennial grasses to the rotation in dry districts should be made gradually, so that there may be no difficulty in adjusting the farm organization to the change. It is hardly necessary to point out that if the cropping system is altered to include the growing of the forage grasses and legumes, provision for the economical use of this forage by means of live stock, should also be carefully planned, as otherwise the benefit to the soil arising from the change may be secured at too high a price.

As curative measures after soil starts to blow there is very little effective treatment that can be given. Where isolated spots only are affected, such as light knolls or exposed elevations, spreading manure either in strips or over the whole surface will lessen the injury. Plowing furrows five to ten rods apart on the lee side of such drifting areas, while a very drastic measure, is one that is advisable where a small area of drifting soil in a larger area of good soil is likely to result in injury to the whole if not controlled in the early stage of the blowing. The drifting particles that leave such light areas may during the course of several days of blowing affect several parts of the field, since they move readily from one place to another, doing injury at every move. It thus happens that from one small patch of poor land a large acreage may be severely damaged if drastic measures are not taken in the early stage of the storm. Land which is blown badly should be seeded to a quick growing crop when moist, and grass seed can later be sown in the stubble at a time when the ground has moisture to germinate the seed.

The fallow is the worst to suffer from soil drifting, and the danger is greatest in May but may occur in winter. The damage is increased when such surface tillage as discing and harrowing (which tend to make the soil fine and loose on top), is practised; it is lessened by deeper tillage with cultivators which leave the soil in a rough, more or less lumpy condition, and preferably in shallow ridges. If this treatment is not sufficient to control the drifting, a thin seeding of oats may be sown on the fallow in July and August, or in some districts corn may be used as a partial substitute for the fallow. In case one or other of these fails to produce the desired results, winter rye, which establishes itself

in the fall and which has possession of the ground in May, and is, therefore, likely to prevent blowing, may be used. Under more serious conditions of soil drifting it may be necessary to grow perennial or biennial crops and sow cereals only on the sod land, or to so build up the organic matter content of the soil by using hay and pasture crops and farmyard manure, that when intelligently tilled, the land will not be likely to blow."

WHAT OTHER STATES AND PROVINCES ARE DOING TO CONTROL SOIL DRIFTING

Your Commissioners found that a variety of practices are employed in the several states and provinces where soil drifting is a problem. In the state of Kansas considerable success has attended the practice of ridging the soil, as with the duckfoot cultivator, and serious drifting is arrested by plowing furrows a few rods apart at right angles to the prevailing wind. Winter wheat is largely grown in that state and protects the soil in the early spring when the damage from drifting is greatest. The summerfallow which in Saskatchewan is not only a contributory cause of soil drifting but also the worst to be affected by it, is very largely replaced by corn in the Dakotas. Winter rye is also used in preference to spring grown cereals on drifting land in North Dakota. On such land a rotation is practised which reduces the frequency of plowing to a minimum, thus keeping it compact and in condition to resist the wind. Sweet clover is being used to some extent in rotations, although brome grass is better as a soil binder than either the legumes or the other grasses commonly grown. Winter rye is becoming increasingly popular in Alberta also. As less new land is being developed, the disc and the drag harrow are being used less and the subsurface packer more, and especially on newly plowed land. On the Noble farms the rod weeder or cultivator is employed effectively. In Manitoba it was observed that many farmers are using manure or straw to prevent drifting or to check it when it begins. The acreage seeded to grass is also being extended in that province. In all the provinces and states visited it was evident that tillage practices are being introduced to leave the surface or cultivated ground somewhat lumpy or granular instead of in a pulverized condition. Indeed, it is generally admitted that the amount of work needed on old land to keep weeds under control is about as much as a farmer can safely or profitably perform. The practice of spreading manure or straw on knolls or spots likely to blow is one which is becoming more popular and has much to commend it.

CREDIT FACILITIES

The question of "credits" is of great importance in a newly developed region. Many homesteaders begin farming with very little capital and unless they have financial backing their progress is necessarily slower as they have to do without some necessary "capital equipment"—(machinery, buildings, stock, etc.), until they make money to pay for it, or are able to buy these things on credit terms from dealers.

Credits are very naturally divided into two classes—long term credits and short term credits.

Long term credits as a rule are secured by fixed assets such as real property, and the farmers of the province have several lines of outlet for this class of loans, namely the Farm Loan Board of the Pro-

vince, the life insurance companies, who are looking for farm loans through which to invest a certain portion of their surplus funds, trust companies and the regular real estate loan companies, who make this class of loans for their clients. As a rule these loans are for a term of 5 or 10 years. The province, through the Farm Loan Board, has now introduced a still longer term loan which is very elastic in its terms. The proceeds of long loans on fixed assets would naturally be used for making permanent improvements on farms, such as buildings, fences, silos or buying more land, and the security is mainly the land on which the loan is advanced, although the reputation of the borrower is regarded by most investors as of as great importance as the property.

Short term credits are usually made for some special purpose such as operating expenses while a crop is growing, lumber for a granary needed to house the crop, or buying steers to fatten for market, and when this purpose has been served the money is to be returned to the lender. As a basis for such credits the lender must always take into consideration the borrower's ability to pay as well as his honesty. The ability to pay is largely based on what his statement discloses in the way of liquid assets such as (in the case of a farmer) live stock, which is being prepared for market, grain, wool or some other product of the farm. The banks have been indicating their willingness to assist the farmers to increase their live stock holdings, and thus increase the production and profits of the farm.

A form of short term loan is provided under the Saskatchewan Live Stock Purchase and Sale Act which enables farmers to buy pure bred bulls, boars and rams and grade cows and heifers, and ewes on credit terms from the Provincial Department of Agriculture.

Several options are provided with cash payments on from 25 to 50 per cent. of the price of the animals and with a maximum credit of \$1,000, depending upon the option. Applicants for credit for live stock must be honest and capable of making a success in raising live stock and must have the necessary facilities for housing, feeding and managing properly the live stock which they desire to buy.

One point must always be kept in mind, and that is that credits of any kind are always a business transaction and not a donation. In the case of a bank, it is not handling its own funds, but trust funds, which it has agreed to return to the owners, and which are left with it on the express understanding that it will not take undue chances with them. Proof that a person is able to make profitable use of credit usually makes him a welcome borrower.

The use to which borrowed money is put is important. What one does with one's own money is not particularly the bank's business, but what is done with borrowed money is the lender's business almost, if not fully, as that of the borrower, and credits to a farmer should be for productive purposes.

At the present time money for loaning purposes is not plentiful anywhere, but "tight" money is always followed by "easier" money. Farm loans may be hard to get now as well as short time credits, but when the reaction starts, the condition from the standpoint of the farmer will improve, and as prices come down, it will not take as much money or credit to carry on business.

The inflation period seems to be nearing a close, and in place of a desire to speculate, people will try to pay debts and keep out of debt. After the turn has been definitely made and business is known to be receding, it is sound policy to grant credits freely to people of assured debt

paying ability, and the farmer in any ordinary line of agriculture is then a better credit risk than during the inflation period, provided he keeps his expenses within reason.

Some farmers through crop failure have been unable to meet their payments and have accordingly fallen behind in their efforts to pay off their debts. In other words, their debt paying ability has been very low. Their property is mortgaged and in many cases is further encumbered by mechanics' liens and government and municipal seed and relief liens, and sometimes by other debts as well.

Further credit seems at times to be an essential for such persons to enable them to "carry on" and buy seed, feed and other essentials for cropping. But strict business principles would forbid the granting of further credit until it can be shown that the future is sure to be more favorable and success more certain than in the past. This, of course, is beyond the ability of man to forecast or guarantee, and thus men who already have had more credit than they have been able to repay must have what further assistance is given them on other than business principles if they are to have it at all. In such a class seem to be loans by municipalities and governments for seed, fodder and relief. In the opinion of your Commissioners advances of this kind should only be made in future after more than ordinary care has been had to enquire into individual circumstances, and only in cases where the ultimate success of the applicant seems to be reasonably well assured. Your Commissioners wish to point out, however, that a necessary part of reconstruction is a sound foundation. The present may be regarded as a reconstruction period in the agriculture of the southwest, for which a first essential is a *safe system*. In the previous chapter such a system is outlined. To adopt such a system will probably necessitate the use of more credit, and it is hoped that necessary funds may be available through the means which are herein discussed. For some, that credit will not probably be available at the outset, and it will be necessary for such persons to prove their debt paying ability, as so many have had to do, before credit institutions will be ready to serve them. However, the man who demonstrates that he can succeed will usually be able to borrow if he needs to.

CO-OPERATIVE MARKETING OF LIVE STOCK

Your Commissioners were informed during the enquiry that unsatisfactory local marketing conditions discourage live stock development; that the man with only one steer or half a dozen pigs or less than a carload of stock to sell, cannot get a reasonable bid for his animals; and that buyers sometimes "pay" for stock with cheques which the banks will not honour.

The safest and surest cure and the one most readily available for these difficulties is obtained by producers shipping co-operatively.

Co-operative live stock shipping associations are easy to organize, simple to operate and satisfactory to patronize. They get carload service for the seller of even a single animal and the shipper is able through their assistance to get for his stock its market value on the day he sells. Persons interested can obtain information and assistance in organizing, by writing to the Co-operation and Markets Branch of the Department of Agriculture at Regina.

EXTENSION SERVICES IN AGRICULTURE

Extension service may be defined as the organisation engaged and the methods employed in spreading a knowledge of any given subject so that those who may profit by such knowledge may have the opportunity of gaining it. In agriculture a great mass of experimental knowledge has been gathered, studied and related to given phases of the subject, but the methods of disseminating this have been such that only the most alert and progressive farmers have been made aware of it.

Then there are farmers in every community who have succeeded better than their neighbors in growing crops. A study of their methods is profitable in so far as it reveals the "why" of their success and this information should be "extended" to all neighbors who it may vitally affect.

Marketing is no less important than producing. Nowadays the man who has small quantities of certain commodities to sell is at a disadvantage unless he markets intelligently and puts his wares on a suitable market and in marketable condition. A great deal can be done in an "extension" way in disseminating information of this nature and in aiding producers to organise marketing associations to dispose of eggs, wool, potatoes and live stock.

Sometimes producers are in need of better sires, better seed, more fodder, etc. In such cases an extension man could give splendid service to his district in ascertaining the need and in locating the commodity in demand.

Again an insect pest like the grasshopper or the cutworm suddenly makes its appearance and does a great deal of damage. Expert knowledge and organised effort are needed for combatting it, and here is a field of service for the right kind of man.

Or disease of live stock appears and takes its toll of animal life. The extension man may not be a veterinarian but he may be able to give first aid or advise as to where competent aid might be had.

If new and unfamiliar noxious weeds are making their appearance he may save the community a lot of trouble and loss by identifying them in time and in getting the farmer "on guard." Or he may be able to show from the experience of some other farmer under similar conditions that a certain method of handling weeds is cheaper and better than the method being followed.

Men who have done this class of work in Ontario for a dozen years, serving as the "community hired man," are known as agricultural representatives. As a rule their territory is one county. Frequently each representative has an assistant. In the States they are known as "county agents," and their plan of organisation is somewhat similar, although in many of the states the County Farm Bureau which includes the leading farmers of the county and has a membership of from 100 to 500 farmers with an annual membership fee of from \$5.00 up, is the power behind the "county agent" in his work. They employ him and direct his activities and the Bureau usually receives some assistance in the form of grants from the Federal, State and County Governments varying in amount in different states.

While recognising the value of the work undertaken by the Extension Department of the College of Agriculture, your commissioners are of the opinion that in a province so large as Saskatchewan it is difficult to have important information carried to every man (and usually he who is most in need is hard to reach) or to render service in marketing and improving the quality of agricultural produce without having in the field at all times a corps of specially trained men, representative of the College and Department of Agriculture.

Having in view the special need which exists at present in the semi-arid areas of adopting a system of farming which will best suit the existing conditions and prove a source of strength in adverse seasons, your commissioners recommend:

(a) That the Government of Saskatchewan undertake to employ upon the request of rural municipalities and on the recommendation of the College of Agriculture a staff of agricultural representatives trained in the science and skilled in the practice of agriculture.

(b) That the service of these agricultural representatives be made available to the farmers of Saskatchewan on the following plan:

(1) That the area in which an agricultural representative may be stationed shall so far as possible consist of four rural municipalities forming a square.

(2) That at least three of the four municipalities shall through their councils request the services of an agricultural representative and contract to raise, in such manner as they may decide, a sum adequate to finance the work of the agricultural representative exclusive of his salary, but including travelling and office expenses, printing and other expenses incidental to his work.

(3) That an advisory committee be appointed for the purpose of planning and supervising the work of their representative.

(c) That pending the appointment of a staff of agricultural representatives, which to be successful must be developed carefully and on sound lines, a vigorous campaign be organised to acquaint farmers of Western and Southwestern Saskatchewan with the findings of the commission and its recommendations respecting the production of crops and live stock in areas of limited rainfall.

BETTER FARMING CONFERENCE, 1921.

The Better Farming Conference held at Swift Current in July, 1920, by resolution recommended the holding of such a conference annually. In this recommendation your Commissioners concur, as such gatherings aid in a very substantial measure in the dissemination of agricultural information, and are valuable in this respect.

All of which is respectfully submitted.

(Signed) W. J. RUTHERFORD
JOHN BRACKEN
GEO. SPENCE
H. O. POWELL
NEIL McTAGGART

APPENDIX

Following is a list of Field Husbandry Circulars which may be obtained upon application to the Field Husbandry Department, College of Agriculture, Saskatoon.

- No. 1. Farm Forestry and Horticulture.
- “ 2. Seed Grain, Seed Treatment and Seeding.
- “ 4. The Best Variety of Farm Crops for Saskatchewan.
- “ 6. The Summerfallow.
- “ 7. The Tillage of Stubble Land.
- “ 8. The Tillage of Prairie Sod.
- “ 9. Alsaka Wheat—A Fraud.
- “ 14. Hay and Pasture Crops for Saskatchewan.
- “ 15. Alfalfa in Saskatchewan.
- “ 16. Alfalfa Seed Production.
- “ 17. Corn Growing in Saskatchewan.
- “ 19. Potato Growing in Saskatchewan.
- “ 21. Winter Rye.
- “ 26. Durum Wheat.
- “ 27. The Culture of Flax in Saskatchewan.
- “ 29. Sunflowers for Silage.
- “ 48. The Problem of Crop Production.
- “ 50. Lessons from the Rust Epidemic of 1916.
- “ 55. Gardening in Saskatchewan.
Profitable Crops on the Drier Lands of Saskatchewan.
- “ 20. Sweet Clover.
- “ 31. Kubanka Wheat.
- “ 32. The Pit Silo.

